Three Essays on the Role of Information and Financial Literacy in Crowdinvesting

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To the Reader

The world of corporate finance and financial reporting is changing rapidly. Traditional means of entrepreneurial financing like bank loans and venture capital are being supplemented by innovative mechanisms such as crowd-sourced financing. However, the key economic challenges to corporate finance, adverse selection and moral hazard, remain.

From the perspective of a financial accountant, this begs the question as of how information flows on these innovative asset markets need to be structured so that the wisdom of the crowd can actually materialize. How should the demand for information by investors be balanced with the direct and indirect costs of transparency? How do information and market design aspects interact? Do crowdinvestors demand the same information like retail investors in established equity markets? What is their information acquisition and investment behavior? Do institutional investors exist in these markets and if they do, how do they differ from retail investors in their behavior?

Many exciting issues, for sure. I congratulate Nader Hemaidan for identifying this research area. Although he does not settle all of the above issues with his work (who could?), he provides fascinating insights into the world of equity crowdfunding. Collaborating with Companisto, a leading German equity crowdfunding platform, he explores the equity crowdfunding universe. He studies the heterogeneous investors that make crowdinvesting an exciting new market. Using unique data, he is able to document the determinants of their investment decisions. Also, he is using Google Analytics data to study their information acquisition behavior in more detail. In his final project, which is still ongoing, he explores the financial literacy of crowdinvestors and whether online financial education tools affect their investment and information acquisition behavior.

Taken together the findings of these studies help us to understand the developing equity crowdfunding market better. Equity crowdinvestors appear to be relatively financially literate. Retail crowdinvestors use information differently compared to institutional investors. Overall, they do not seem to exhaust the available information. All these insights are to a large extent new to the literature. Thus, the work of Nader Hemaidan contributes to the academic debate by providing genuinely new and relevant results that will help mapping the crowdinvesting landscape. I hope that his studies will be widely read and used.

Berlin, January 29, 2018
Joachim Gassen

Danksagung (Acknowledgments)

Die vorliegende Arbeit ist das Ergebnis meiner Tätigkeit als Promotionsstudent und wissenschaftlicher Mitarbeiter am Institut für Rechnungswesen und Wirtschaftsprüfung der Humboldt-Universität zu Berlin. Sie wurde im Sommersemester 2017 an der Wirtschaftswissenschaftlichen Fakultät der Humboldt-Universität eingereicht. Ohne die Hilfe vieler Personen im beruflichen und privaten Umfeld wäre dies niemals möglich gewesen. Ihnen sei im Folgenden gedankt.

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Ich wünsche allen hier genannten und auch allen nicht genannten Menschen, die mich in den fünf Jahren meiner Promotion begleitet haben, alles Gute auf ihrem weiteren Weg.

Berlin, 29. Januar 2018
Nader Hemaidan

For Mihaela

Abstract

English: This cumulative Ph.D. thesis investigates the role of information and financial literacy in the German crowdinvesting market. Using proprietary investor-level data from Companisto, one of the largest German crowdinvesting portals, the first paper explores how the magnitude of start-ups' disclosures on Companisto is associated with crowdinvestors' investment behavior. For this purpose, I develop five indices that capture the extent of start-ups' different types of voluntary disclosures. My findings suggest that the investment decisions by both retail and institutional crowdinvestors are positively associated with the magnitude of start-ups' voluntary disclosures. However, while start-ups' 'soft' disclosures seem to play a role in the decision-making of (inexperienced) retail investors, they appear to be irrelevant for the investment decisions of institutional investors. My second thesis paper uses investor-level Google Analytics data to explore investors' actual information acquisition prior to investing. My results indicate that crowdinvestors tend to neglect a substantial fraction of start-ups' disclosures before investing. Moreover, I show that investors' information acquisition varies with their demographics, their level of crowdinvesting experience as well as their (average) investment amounts. My findings further suggest that investors acquire less information in the presence of potential signals of start-up quality and (thus) in cases where the investment appears to be less risky. In my third paper, which is co-authored by Joachim Gassen, I study the causal effect of online financial training on crowdinvestors' information and investment behavior by conducting a field experiment on Companisto. While the experiment is still ongoing, the interim report included in my thesis motivates the overall research question and explains the research design. Our preliminary results indicate that, compared to survey samples representative for the overall population, crowdinvestors exhibit a significantly higher level of 'basic' financial literacy.

Deutsch: Diese kumulative Dissertation untersucht die Rolle von Informationen und Finanzkompetenz im deutschen Crowdinvesting-Markt. Die erste Studie erforscht den Zusammenhang zwischen dem Umfang der von Start-Ups auf Companisto veröffentlichen Informationen und dem Investitionsverhalten von Crowdinvestoren auf Basis von proprietären Nutzer-level Companisto-Daten. Zu diesem Zweck entwickle ich fünf Offenlegungsindizes, die den Umfang der publizierten Unternehmensinformationen erfassen. Meine Ergebnisse deuten darauf hin, dass die Investitionsentscheidungen von privaten und institutionellen Investoren positiv mit dem Ausmaß der freiwillig von Start-ups publizierten Informationen zusammenhängen. Während (unerfahrene) private Investoren auch „weiche" Informationen im Rahmen ihrer Investitionsentscheidungen zu berücksichtigen scheinen, haben diese scheinbar keine Entscheidungsrelevanz für institutionelle Investoren. Meine zweite Studie untersucht das tatsächliche Informationsverhalten von Crowdinvestoren im Vorfeld von Investitionen auf Basis von Nutzer-level Google Analytics-Daten. Meine Ergebnisse deuten darauf hin, dass Investoren einen Großteil der von Start-ups bereitgestellten Informationen im Vorfeld von Investitionen ignorieren. Darüber hinaus zeige ich auf, dass das Informationsverhalten von Investoren mit den demografischen Merkmalen, der Crowdinvesting-Erfahrung und den (durchschnittlichen) Investitionsbeträgen von Investoren zusammenhängt. Meine Ergebnisse deuten zudem darauf hin, dass Investoren beim Vorliegen potentieller Indikatoren für die Qualität eines Start-ups bzw. bei weniger riskanten Investitionen, weniger Information akquirieren. In meiner dritten Studie, welche ich gemeinsam mit Joachim Gassen durchgeführt habe, untersuche ich den kausalen Effekt einer Online-Finanzschulung auf das Informations- und Investitionsverhalten von Crowdinvestoren im Rahmen eines Feldexperiments auf Companisto. Während das Experiment nach wie vor läuft, motiviert der in dieser Dissertation enthaltene Zwischenbericht die zugrundeliegende Forschungsfrage und beschreibt das Forschungsdesign. Unsere vorläufigen Ergebnisse zeigen auf, dass Crowdinvestoren im Vergleich zu repräsentativen Stichproben der Gesamtpopulation, welche vergleichbaren Studien zugrunde liegen, ein signifikant höheres Maß an finanzieller Grundkompetenz aufweisen.

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An Introductory Summary

In today's global economic ecosystem, innovation constitutes a key determinant of survival (Audretsch 1995). Over the past decades, the ideas of a few visionaries that, particularly in Silicon Valley, have been rapidly translated into economic reality have gradually changed the economic landscape and social life around the world. Technological innovations like Apple's iPhone, for example, that have triggered the abrupt downfall of blue-chip industry leaders such as Nokia have significantly increased pressure on businesses and economies, respectively, to strive for technological leadership and innovative edge (Vuori and Huy 2016). Consequently, the establishment of a political and economic environment in which innovative ideas can be turned into successful ventures has become one of the main objectives of the world's political leaders.[1] Nevertheless, a key obstacle to innovation continues to be the limited availability of early-stage financing. Despite all political aspiration and increased public funding, restrictive loan policies and relatively high costs of going public still prevent many entrepreneurs from realizing their ideas (Bradford 2012).

In recent years, however, alternative forms of financial markets have emerged that are widely considered to exhibit the potential to (at least partially) close the financing gap for early-stage ventures (Bradford 2012; Mollick 2014; Colombo *et al.* 2016). One prominent example is crowdinvesting. This relatively novel form of internet-based crowdfunding allows entrepreneurs to finance their ventures by collecting relatively small individual contributions from a relatively large number of individuals (Bradford 2012; Mollick 2014). In return for their contributions, crowdinvestors typically obtain a right in the future cash flows of the start-up. Due

[1] For example, on February 25, 2014, then U.S. President Barack Obama in a speech at the White House declared that "*keeping America at the cutting edge of technology and innovation is what is going to ensure a steady stream of good jobs into the 21st century*" and continued to describe innovation as "*the single most important thing about American economy*".

to its internet-based and thus easily accessible nature and the usually small minimum investment amounts, crowdinvesting is particularly attractive for retail investors (Hornuf and Schwienbacher 2016).

As it combines highly risky start-up investments and retail investors, the long-term success of crowdinvesting will depend on regulators' ability to find the right balance between investor protection and their objective to "*cut away the red tape that prevents too many rapidly-growing start-up companies from raising capital and going public*".[2] Among other things, legislators must decide on a minimum level of disclosures (investor education material) that start-ups (so-called crowdinvesting portals) must provide to investors. Naturally, the optimal level of regulation should account for crowdinvestors' actual information behavior and their ability to identify and process potentially relevant financial information (Mäschle 2012; Cumming and Johan 2013).

My thesis adds to this topic by investigating (1) the role of start-ups' disclosures for crowdinvestors' investment behavior, (2) the extent and determinants of crowdinvestors' information acquisition, and (3) the effect of online financial education on crowdinvestors' information and investment behavior. For all three projects that constitute this thesis, I collaborate with *Companisto*[3], one of the largest German crowdinvesting portals which allows me to use proprietary (anonymized) investor-level data for my analysis.[4]

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[2] On September 8, 2011, then U.S. President Barrack Obama addressed Congress in a joint session about jobs and the economy.

[3] The (English version of the) *Companisto* webpage, *i.e.*, the setting and a large proportion of the data that I am using for my three thesis projects, can be accessed through https://www.companisto.com/en.

[4] As all three studies constituting this Ph.D. thesis investigate investor behavior in crowdinvesting (on *Companisto*), there are certain, and in some cases inevitable, similarities in the structure and contents of these studies. Specifically, as the order of the papers presented in this study reflects the chronology of their first drafts, my second (and third) study build(s) up on my first (and second) study. These similarities are particularly pronounced in the discussion of the related literature [pages 89 to 90 (151 to 152) of the second (third) paper build up on pages 12 to 13 and pages 23 to 29 of the first (and pages 89 to 90 of the second) paper], the description of the institutional environment [pages 91 to 97 (153 to 154) of the second (third) paper build up on pages 17 to 23 of the first (and pages 91 to 97 of the second) paper], and the (discussion of the) variables used in the empirical analysis [pages 98 to 103 of the second paper build up on pages 31 to 38 of the first paper]. As all three studies have not been previously published, for the scope of this dissertation, I generally abstain from self-quotations. However, in places, I discuss the results of my prior studies or name them as examples for prior findings.

The first paper of my thesis, titled *The Role of Disclosure in Crowdinvesting: Investor-Level Evidence*, explores how the extent of firms' voluntary and typically unaudited disclosures on *Companisto* is associated with crowdinvestors' investment behavior. For this purpose, I develop two indices that capture the magnitude of firms' voluntary disclosures related to (1) financial information and (2) the attributes of the managing team. In addition, I account for firms' 'soft' disclosures by including the length of the pitch video as an additional disclosure measure. The usage of investor-level data allows me to explore how the association between firms' disclosures and crowdinvestors' investment behavior varies with investors' characteristics (*e.g.*, their demographics and investment experience). Specifically, based on investors' profile information on *Companisto*, I am able to differentiate between retail and institutional investors. Consistent with the evidence provided by research on traditional capital markets (see Beyer *et al.* 2010 for an overview), research on peer-to-peer lending (Michels 2012) and crowdinvesting (*e.g.*, Ahlers *et al* 2015; Moritz *et al.* 2015; Block *et al.* 2016), my findings suggest that the likelihood of investments by both retail and institutional crowdinvestors is increasing in the magnitude of start-ups' voluntary disclosures on *Companisto*. Specifically, I find that crowdinvestors are more likely to invest in start-ups that provide higher levels of forward-looking financial disclosures and more information on the managing team. My results indicate that these associations are more pronounced for institutional investors. While my findings suggest that start-ups' 'soft' disclosures (*i.e.*, the pitch video) play a role in the decision-making of (inexperienced) retail investors, they appear to be irrelevant for the investment decisions of institutional investors. In line with these findings, I additionally show that not only the decision to invest but also the investment amount is increasing in the extent of start-ups' voluntary financial disclosures.

In my study, I use large-scale investor-level data to empirically investigate the determinants of crowdinvestors' actual investment decisions. I thereby add to a series of papers that

examine the drivers of 'crowdinvesting success' (*e.g.*, Ahlers *et al.* 2015). Specifically, by exploring how crowdinvestors' investment behavior is related to start-ups' attributes (*e.g.*, their disclosures) and by showing how these associations vary with investors' demographics (*i.e.*, age and gender), their level of sophistication, and crowdinvesting experience, I add to this stream of literature.

My second thesis paper, titled *Crowdinvestors' Information Acquisition: An Analysis of Investor-Level Google Analytics Data*, is closely related to my first project as it explores crowdinvestors' information behavior. For this purpose, I use investor-level Google Analytics data that allows me to track down investors' actual information acquisition on *Companisto*. Given that I am the first to use this relatively novel type of data in an investment context, my study does not only contribute to related research in crowdinvesting (Moritz *et al.* 2015; Bernstein *et al.* 2017), but also adds to a series of papers that use aggregate Google searches (Drake *et al.* 2012) or the download activity on EDGAR[5] (*e.g.*, Loughran and McDonald 2017) to provide direct evidence on investors' information acquisition. Given the obvious constraints regarding the availability of investor-level data, prior research on investors' information behavior is largely based on survey (*e.g.*, Elliott *et al.* 2008) or experimental evidence (*e.g.*, Frederickson and Miller 2004) (see Cascino *et al.* 2013, 2014 for an overview and a more detailed discussion). While it is not clear to which extent my results are representative for investors that engage in traditional capital markets, the crowdinvesting setting bears several advantages from a research perspective. Given the typically low legal disclosure requirements and relatively short operating history of early-stage start-ups, firms' disclosures on crowdinvesting portals typically reflect a large fraction of their overall information environment (Bradford 2012; Michels 2012). More importantly, due to the internet-based nature of crowdinvesting, firms' disclosures as well as investors' information and investment behavior can all be observed on the

[5] Electronic Data Gathering, Analysis, and Retrieval system.

crowdinvesting portal. This allows for an investor-level analysis of crowdinvestors' actual information behavior prior to investing.

My results indicate that crowdinvestors tend to neglect a substantial fraction of start-ups' disclosures before investing. Specifically, I find that prior to only about 50 percent of all investments, investors access firms' financial forecasts. Moreover, I show that investors' information acquisition varies with their demographics, their level of crowdinvesting experience as well as their (average) investment amounts. My findings are further consistent with investors acquiring less information in the presence of potential signals of start-up quality. Specifically, in line with related survey evidence (Moritz *et al.* 2015), I find that investors decrease their information acquisition following professional investments that are made and publicly disclosed during the crowdinvesting campaign. Moreover, my results indicate that investors' information acquisition is negatively associated with the stage of the funding round with this association being more pronounced for more experienced crowdinvestors. Finally, my findings suggest that investors acquire less information for firms that hold patents and (thus) for less risky investments.

The third paper of my thesis is co-authored by Joachim Gassen and titled *Financial Education in the Crowdinvesting Market: Preliminary Evidence from a Randomized Field Experiment*. The overall objective of the project is to study the causal effect of online financial education on crowdinvestors' information and investment behavior by conducting a field experiment on *Companisto*. It therefore directly builds up on the evidence provided in my first and second project. While the experiment is still ongoing, the interim report included in my thesis motivates the overall research question and explains the research design. The report further comprises an analysis of the determinants of program enrollment, participation, persistence and performance.

The contents of the randomly administered online education program were designed in collaboration with *Companisto* to teach basic and start-up-related investment knowledge. During the treatment period, a randomly selected group of investors (our treatment group) was invited to participate in the online education program. The program contained a so-called Entry-level-Test (ELT) that subjects were required to take before they obtained access to the education material which allowed us to measure the pre-treatment level of financial literacy of all enrolled individuals and to compare their level of financial literacy with levels of financial literacy documented in prior research. Consistent with related evidence (Krische 2014), we find that, compared to survey samples representative for the overall population, (crowd)investors exhibit a significantly higher level of 'basic' financial literacy.

Our results further indicate an overall positive association between program enrollment and investors' crowdinvesting exposure. Furthermore, we find that very inexperienced crowdinvestors are also more likely to enroll, suggesting that our education program reaches its targeted audience. In line with this evidence, our findings further suggest that investors who assess their financial educational background to be weak are more likely to participate in financial literacy interventions and more persistent in their program attendance. Consistent with related research on the determinants of financial advice-seeking (*e.g.*, Bachmann and Hens 2015), our results, however, indicate that overall, higher levels of financial literacy are also related positively to the likelihood of program participation and persistence. Finally, we document a positive association between program performance and participants' advanced level of financial literacy and their investment skills.

Once the experiment is completed, the project will further contribute to related research on the effects of financial literacy interventions (see Fernandes *et al.* 2014 for an overview) as we will be the first to provide evidence on the causal effect of financial education on individual information behavior.

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I

The Role of Disclosure in Crowdinvesting: Investor-Level Evidence

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Abstract

This study examines the role of disclosure for investment decisions in the crowdinvesting market. Using proprietary investor-level data from *Companisto*, one of the largest German crowdinvesting portals, I investigate how firms' voluntary disclosures are associated with crowdinvestors' investment decisions. More importantly, I show how this association varies with investors' demographics, their level of sophistication and crowdinvesting experience. My findings are consistent with both retail and institutional investors being more likely to invest in start-ups that provide higher levels of forward-looking financial disclosures and more information on the managing team, with these associations being more pronounced for institutional investors. However, in contrast to institutional investors, the decision-making of (inexperienced) retail investors seems to be also influenced by start-ups' 'soft' disclosures (*i.e.*, the pitch video). The results of an additional analysis further reveal that not only the decision to invest, but also the investment amount is increasing in the extent of firms' voluntary financial disclosures.

Keywords: crowdinvesting, retail investors, microfinance, behavioral finance, crowdfunding, voluntary disclosure

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1 Introduction

In recent years[6], crowdinvesting (CI)[7] has emerged as an alternative source for external financing for early-stage entrepreneurial ventures (Bradford 2012; Mollick 2014; Mortiz and Block 2016)[8]. CI is a special form of internet-based crowdfunding (CF), in which so called CI portals (CIPs) take on the role of financial intermediaries, allowing start-up firms to offer debt and equity(like) securities to the general public. By advertising issuances on their portal webpage and via newsletters to their investor networks, CIPs enable firms to raise capital by collecting relatively small individual amounts from a relatively large number of investors (*i.e.*, the crowd) over the internet. In return for their investments, crowdinvestors receive a claim in the future cash flows of the firm (Klöhn and Hornuf 2012; Mollick 2014; Hornuf and Schwienbacher 2016a,b, 2017).

Compared to other forms of crowdfunding (*e.g.*, lending-based crowdfunding) the market volume of crowdinvesting is still relatively low (Massolution 2015). This is partly driven by the fact that crowdinvesting is subject to securities regulation (Bradford 2012; Klöhn *et al.* 2016). In the U.S., for example, crowdinvesting has been restricted to accredited investors until May 2016 when Title III of the JOBS Act (*i.e.*, the "Crowdfunding Act") came into effect (Hornuf and Schwienbacher 2016b). In many European countries, however, CIPs have a longer history in offering equity(like) securities to retail investors (Hornuf and Schwienbacher 2016b,

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[6] As all three studies constituting this Ph.D. thesis investigate investor behavior in crowdinvesting (on *Companisto*), there are certain, and in some cases inevitable, similarities in the structure and contents of these studies. Specifically, as the order of the papers presented in this study reflects the chronology of their first drafts, my second (and third) study build(s) up on my first (and second) study. These similarities are particularly pronounced in the discussion of the related literature [pages 89 to 90 (151 to 152) of the second (third) paper build up on pages 12 to 13 and pages 23 to 29 of the first (and pages 89 to 90 of the second) paper], the description of the institutional environment [pages 91 to 97 (153 to 154) of the second (third) paper build up on pages 17 to 23 of the first (and pages 91 to 97 of the second) paper], and the (discussion of the) variables used in the empirical analysis [pages 98 to 103 of the second paper build up on pages 31 to 38 of the first paper]. As all three studies have not been previously published, for the scope of this dissertation, I generally abstain from self-quotations. However, in places, I discuss the results of my prior studies or name them as examples for prior findings.

[7] This form of crowdfunding is also referred to as investment-based crowdfunding, equity-based CF or securities-based CF (Hornuf and Schwienbacher 2016b, 2017).

[8] Note that the descriptions in the entire following paragraph are based on Klöhn and Hornuf (2012), Mollick (2014), and Hornuf and Schwienbacher (2016a,b, 2017).

2017). According to the European Alternative Finance Industry Report (2016), the European crowdinvesting market (excluding its biggest market, the UK) reached close to 160 million Euro in volume in 2015 accounting for 16 percent of the total crowdfunding volume in this region. While, compared to established capital markets, the market size is still relatively low, it shows significant growth. In 2015 the volume of the European market increased by roughly 80 percent (European Alternative Finance Industry Report 2016).

Due to the combination of risk-capital investments, a prevalence of retail investors and severe information asymmetries, the emergence of CI has naturally attracted the attention of both regulators and scholars (Agrawal *et al.* 2014). While the former must handle the balancing act between investor protection and the exploitation of CI's potential to fill the gap in early-stage financing (Bradford 2012), to scholars CI offers a fruitful setting for research on retail investors. An important question in this setting is the question as to what drives the decision of crowdinvestors to invest in a specific start-up firm. To shed more light on this topic, I examine how firms' voluntary disclosures are related to the investment behavior of different groups of crowdinvestors.

In recent years, a growing body in the academic literature has examined the determinants of fundraising success (*i.e.*, the amount and frequency of contributions) in other forms of CF (see Belleflamme *et al.* 2015; Moritz and Block 2016; Wallmeroth *et al.* 2017 for an overview of the literature on CF). However, there is still relatively little empirical evidence on CI. Prior findings generally suggest that attributes of the managing team (*e.g.*, Ahlers *et al.* 2015; Bernstein *et al.* 2017), investments by others (*e.g.*, Kim and Viswanathan 2016; Vismara 2017a) and information updates by the firm (*e.g.*, Block *et al.* 2016; Hornuf and Schwienbacher 2016b; Dorfleitner *et al.* 2017) are related to the investment behavior of crowdinvestors. However, many prior studies on CI focus on the behavior of accredited (*i.e.*, wealthy and/or sophisticated) investors, which might not be representative for the 'general public' (*i.e.*, the crowd). Other

studies use publicly observable data on individual investments. As this data is typically not matched on the investor-level, a differentiated analysis that exploits heterogeneity in investor characteristics is not possible. A recent exemption represents a study by Wallmeroth (2016) who uses hand-collected data from *Companisto* that he matches on the investor-level for a selected sample[9] of investors to analyze the likelihood of "unsuccessful investments" (*i.e.*, investments in start-ups that went bankrupt) for different investor groups that he categorizes based on their number of investments and average investment amounts. Thus, by investigating how crowdinvestors' investment propensity as well as their investment amounts are associated with firms' voluntary (and forward-looking financial) disclosures and by using investor-level data to show how these associations vary with investors' demographics (*i.e.*, age and gender), their level of sophistication and crowdinvesting experience, I add to this stream of literature.

Given that in many jurisdictions CI-specific regulations are lax or not yet in effect[10], the structure of global CI markets and hence the disclosure requirements in the scope of CI offerings are often shaped by existent national securities laws (Hornuf and Schwienbacher 2017). In Germany, for example, most CIPs have adopted investment models that neither require registration with the Federal Financial Supervisory Authority (BaFin) nor meet prospectus requirements (Klöhn and Hornuf 2012; Hornuf and Schwienbacher 2017).[11] In consideration of the

[9] As investors can hide their names and other information, for some investors, it should be hard if not impossible to reliably identify them based on the publicly available information (*i.e.*, investment history of each crowdinvesting). Also, in case of multiple investments of one investor in a start-up, the aggregate investment amount is presented at the time of the first investment. As crowdinvestors' decision to hide personal information might be related to their (other) characteristics and behavior, analyses based on self-constructed investor samples might lead to biased results.

[10] For an overview of the regulation of CI markets in selected (European) countries, see Hornuf and Schwienbacher (2017).

[11] On July 10, 2015, the German Retail Investor Protection Act (*Kleinanlegerschutzgesetz*) came into effect. However, as the sample period of my study ends in January 2015, this regulation had no effect on the data used in the scope of this study. Moreover, the act does not affect the exemption from prospectus requirements for the sale of certain forms of mezzanine financing (*e.g.*, subordinated participation loans) if they are sold in a CI funding round and the total amount that the issuer offers on the CIP does not exceed 2.5 million Euro. However, the Act introduced increased disclosure requirements for start-ups that seek financing through crowdinvesting. See Klöhn *et al.* (2016) for a discussion of the novel regulation.

generally low legal disclosure requirements for small-sized firms, the magnitude of (non)financial information that fund-seeking firms must provide in the scope of CI listings is low and primarily set by CIPs (Mäschle 2012; Cumming and Johan 2013). Taking further into account the lack of operating history and hence the absence of (audited) financial statements, the (assumptions underlying the) financial information disclosed on CIPs is typically not subject to documented third-party verification (Mäschle 2012; Michels 2012; Cumming and Johan 2013). Furthermore, in contrast to firms listed on established capital markets that normally use multiple channels to disclose their private information (*e.g.*, conference calls, MD&A, management forecasts, etc.), for fund-seeking start-ups, CIPs typically represent the primary channel to communicate with potential investors (Michels 2012).[12] Therefore, compared to most prior studies on voluntary disclosure, CF settings allow for a more complete measurement of the overall level of voluntary disclosure (Michels 2012). In addition to the information provided on *Companisto*, for 10 (out of 33) firms in my sample, legally mandated (but unaudited) historical financial statements (*i.e.*, an abbreviated balance sheet and notes) are publicly available during the funding period through the online-platform of the Federal Gazette (Bundesanzeiger).[13]

While a large fraction of the disclosures that firms provide on CIPs are made voluntarily, their degree of reliability differs across content types. On *Companisto*, the financial information

[12] Aside from the information presented on the CIP, entrepreneurs typically use the corporate webpage as well as their (private) social network channels to communicate with their personal network and other potential investors, respectively.

[13] For firms classified as "small" in accordance to the German Commercial Code (Handelsgesetzbuch, HGB), the disclosure requirements comprise an (unaudited) abbreviated balance sheet and notes, which must be filed with the Federal Gazette within 12 months after the fiscal year end. Access to firms' financial information is provided through an online platform and usually free of charge. However, on December 14, 2012 the German Micro-Entities Amending Accounting Law (Kleinstkapitalgesellschaften-Bilanzrechtsänderungsgesetz, MicroBilG) was passed, introducing an additional size category for "micro enterprises" (paragraph 267a HGB). Firms that fall below a certain size threshold can, instead of publication, deposit their financial statements. Deposited financial statements cannot be found through the search engine of the Federal Gazette, but can only be accessed through the German Company Register (Unternehmensregister) for a charge of five Euro. For one (nine) firm(s) in my sample, deposited (published) financial statements were accessible during the funding period.

provided is mostly forward-looking and therefore *ex ante* unverifiable by nature.[14] Taking further into account that no competent third-party audits (the consistency and plausibility of) the information, it is not clear whether investors regard entrepreneurs' disclosed private information as sufficiently credible as to consider it in the scope of their investment decisions (Leftwich 1983; Blackwell *et al.* 1998; Mercer 2004). Analytical research on disclosure indicates that managers' unverifiable disclosures can be credible in certain scenarios (Gigler 1994; Stocken 2000). However, whether these models are applicable to CI markets is unclear (Michels 2012). Consequently, whether firms' unaudited (and forward-looking financial) disclosures are associated with crowdinvestors' investment decisions is an empirical question.

An important feature of my setting is given by the fact that, at registration, investors on *Companisto* must select whether they use their account for "private" investments or as a "company".[15] Given that many "company" accounts belong to Venture Capital (VC) firms (*i.e.*, institutional investors), I can differentiate between two different groups of investors that should, on average, differ with regard to their level of sophistication. A large body of empirical capital market research indicates that the usage and choice of information systematically varies with

[14] Naturally, the specifics of the investment forms as well as the available set of information (*i.e.*, the (mandated) content and structure of start-ups' disclosures on *Companisto*) are subject to constant change (*e.g.*, as a result of regulatory changes). The information presented in the remainder of this paper is therefore not necessarily representative for *Companisto*'s investment forms and the available set of information for the time after my sample period (see Gassen and Hemaidan 2017 and Hemaidan 2017 for a description of the investment forms and information requirements on Companisto as of September 30, 2017). Also, the disclosure requirements discussed in this paper do not consider firms' contractual post-funding information obligations on *Companisto*.

[15] Investors with ("company") "private" accounts are required to provide information on their (firm's registry and) tax identification number before investing. This information is used by the start-ups to deduct the capital gain tax from potential dividend payments. This process is coordinated with local tax authorities and requires the correct tax ID of each investor. As this study only considers investors whose portfolios comprise at least two start-ups, it is unlikely that the sample includes retail investors that falsely register as "companies" and vice versa. However, I cannot rule out that some of the "company" accounts are used by private company owners. Nevertheless, as the full investment history for each listing is publicly disclosed on the CIP (including (firm) names), I can trace many publicly disclosed investments made with account names that indicate institutional investors back to small VC firms. However, given that investors can hide their name, based on the publicly available data, I am not able to assess the share of "company" accounts that are used by professional risk capital providers. For "company" investors that reveal their names (*i.e.,* that can be identified as a firm), the mean (median) value of total assets amounts to 358,489 (115,159) Euro (at the time this analysis was conducted which, for some investors, deviates significantly from the time of their last investment on *Companisto*) with a minimum (maximum) amount of 762 (4,303,052) Euro. In turn, it is likely that some "private" accounts belong to professional investors (*i.e.,* business angels). Generally, both previously discussed cases should work against me finding significant (predictable) differences between the two types of investors.

investors' level of sophistication (*e.g.*, Elliott *et al.* 2008), suggesting that less sophisticated investors tend to ignore relevant information (*e.g.*, Coram 2010; Bhattacharya *et al.* 2012) (see Cascino *et al.* 2013, 2014 for an overview and a more detailed discussion). Furthermore, as institutional investors, *i.e.*, investors that do not invest on their private account, might – in comparison to retail investors – be requested to rationalize their investment decisions, they might place more weight on comparably reliable and/or objective information (*e.g.*, Mason and Stark 2004). More closely related to this study is the evidence on the behavior of capital providers in peer-to-peer lending markets which suggests that unverifiable disclosures are associated with lending decisions (Michels 2012; Duarte *et al.* 2012). However, given that equity and debt providers differ in their information requirements (Cascino *et al.* 2013, 2014) and since the decision to invest in a firm should be driven by more complex and 'harder' factors (*e.g.*, future financial performance, business model, etc.) than the decision to lend money to another individual, it is not clear whether this evidence generalizes to the investment behavior of (different groups of) crowdinvestors (Ahlers *et al.* 2015).

To shed some light on this topic, I develop four measures for the magnitude of firms' voluntary disclosures. The first measure (*fin_discl*) is an index that captures the extent of (selected) financial information (*e.g.*, breakup of the (expected) revenue and costs, cash flow information, etc.) included in start-ups' disclosures. Building up on related evidence on the selection process of risk capital providers, suggesting that the attributes of the managing team are key decision criteria for VC investors and Business Angels (BA) (*e.g.*, Mason and Stark 2004), I construct a second index that captures the extent of information provided on the managing team (*team_discl*). As additional proxies, I include the length of the pitch video (*vid_length*) and the total number of words included in firms' narrative disclosures (*overall_discl*).

Consistent with related evidence (*e.g.*, Ahlers *et al.* 2015; Moritz *et al.* 2015; Block *et al.* 2016; Polzin *et al.* 2017), my findings suggest that the likelihood of investments as well as

the investment amount, for both, retail and institutional investors, are increasing in the extent of selected voluntary (forward-looking financial) disclosures that firms provide on *Companisto*. Compared to retail investors, institutional investors seem to place less (more) weight on relatively 'soft' ('hard') information. Specifically, I find that the length of the pitch video is positively associated with the likelihood of (high) investments by retail investors, while not being associated with the investment propensity and the investment amounts of institutional investors. However, this finding varies with retail investors' demographics and their level of crowdinvesting experience. For crowdinvesting experienced investors aged 30 and above, for example, my results suggest that, analogous to institutional investors, there is no association between the likelihood of investment and firms' soft disclosures (*i.e.*, the length of the pitch video). My findings further suggest that, compared to female investors, forward-looking financial (team) disclosures are relatively less (more) important for male investors' investment decisions.

The remainder of the paper is organized as follows. Section 2 describes the institutional background. Section 3 outlines related research and develops hypotheses. Section 4 describes the data and the research design. Section 5 discusses the main results and additional analyses, whereas Section 6 concludes.

2 Institutional Background

2.1 Defining Crowdinvesting

As there is no common legal definition of crowdfunding, I follow Belleflamme *et al.* (2010:5) who describe CF as a form of fundraising that "involves an open call, essentially through the Internet, for the provision of financial resources either in form of donation or in exchange for some sort of reward (…)". The literature typically identifies four major categories

of CF, which differ in the form of compensation that backers receive in return for their contributions (Klöhn and Hornuf 2012; Ahlers *et al.* 2015; Hornuf and Schwienbacher 2016a,b).[16] The donation-based model where individuals support a project without expecting any form of direct compensation (*i.e.*, out of intrinsic motivation) is the most common form of CF. A prominent example for a donation-based CF portal is *Betterplace.org*, which allows people to donate money to charitable projects (*e.g.*, donation campaigns after natural disasters). In the reward-based model on the other hand, backers are promised a non-monetary reward in return for their contributions. This type of CF is particularly popular in the financing of art projects and video games through platforms such as *Kickstarter* where backers usually receive the product (*e.g.*, a music album) in exchange for their contribution. More recently, two different forms of CF, crowdlending and equity-based crowdfunding, have evolved. In these two models, contributors obtain a financial compensation in return for their investments. In crowdlending markets capital providers receive fixed interest payments and repayment of principal. A prominent example of a crowdlending portal is the peer-to-peer loan marketplace *Prosper.com* where borrowers obtain loans directly from other individuals as a result of a reverse auction. Crowdinvesting typically describes the financing of early-stage ventures through online portals (*i.e.*, CIPs). CI offerings normally involve the sale of equity, debt or mezzanine securities and are therefore subject to securities regulation. In return for their investments, crowdinvestors usually receive a residual claim in the future cash flows of the firm, which is the reason why this form of CF is often referred to as equity-based CF (Klöhn and Hornuf 2012; Ahlers *et al.* 2015; Hornuf and Schwienbacher 2016a,b).

2.2 Crowdinvesting Market Structure

Despite structural differences across countries (*e.g.*, Hornuf and Schwienbacher 2017), CI markets generally involve three key agents: 1) crowdinvesting portals, which take on the

[16] Note that the descriptions in the entire following paragraph are based on Klöhn and Hornuf (2012), Ahlers *et al.* (2015), and Hornuf and Schwienbacher (2016a,b).

role of financial intermediaries, 2) fund-seeking start-up firms and 3) (mostly retail) investors (see Figure 1). Crucial for the emergence of CI as an alternative form for external financing for start-up firms are the services provided by CIPs (Hornuf and Schiwenbacher 2016a). By taking on the role of internet-based financial intermediaries, CIPs enable firms to raise capital by collecting relatively small individual amounts from a relatively large number of investors (*i.e.*, 'the crowd') over the internet (Mollick 2014; Hornuf and Schwienbacher 2017). Specifically, by handling all investment-related transactions, including the offer of standardized financial contracts and the management of payments, CIPs allow entrepreneurs to fund their ventures at relatively low transaction costs (Bradford 2012). Furthermore, as in Germany most CIPs have adopted investment models that neither require registration with the Federal Financial Supervisory Authority (BaFin) nor meet prospectus requirements (Klöhn and Hornuf 2012; Hornuf and Schwienbacher 2017), the information requirements that the issuers must meet, and thus, the direct costs of raising capital are relatively low (Bradford 2012; Mäschle 2012; Cumming and Johan 2013). Hornuf and Schwienbacher (2016a) further point out that aside from financial services, CIPs usually provide marketing and guidance to the entrepreneur and offer an investor network by advertising the securities on the portal webpage and via newsletters. In return for their services, they typically charge a predetermined commission of up to ten percent of the funded amount. Consequently, for start-up firms the direct costs of raising capital through CI only arise in case of successful funding (*i.e.*, if the predetermined funding threshold is reached). If the required amount is not raised within the funding period, investments are typically returned to the investors.[17] In many countries, it is common for CIPs to channel all financial transactions through a trust that earns up to two percent of the transaction value (Hornuf and Schwienbacher 2016a).

[17] As of January 2015, all funding rounds that were conducted on *Companisto* have passed the funding threshold. As of July 2017, three funding rounds that were conducted on *Companisto* were not successful (did not reach the funding minimum of 100.000 Euro).

[Figure 1 about here]

The funding of a firm on a specific CIP is typically the outcome of a multi-layer selection process. If, for example, entrepreneurs' decision to engage in CI is mainly driven by their incapability to convince traditional risk capital providers (*i.e.*, VCs, BAs and banks) of their business idea, the 'quality' of start-ups on CIPs should, on average, be relatively low. However, given that many firms that conduct a crowdinvesting (*e.g.*, on *Companisto*) have already received 'traditional' venture capital before their crowdinvesting campaign, firms' decision to engage in (*i.e.*, select into) CI might rather lie in the fact that CI provides not only financing, but also public attention and a market signal regarding the demand for their product (Agrawal *et al.* 2014). Additionally, as in some countries (*e.g.*, Germany) CIPs differ with regard to their investment models and information requirements, the decision to seek funding through a specific CIP might also be taken strategically.[18] Taking further into account that CIPs selection criteria might favor specific types of start-up firms[19] and are likely to vary across CIPs, empirical evidence based on CIP data (*i.e.*, the results of this study) might not generalize to other CI markets (Belleflamme *et al.* 2015).

2.3 Crowdinvesting on Companisto

Given that a CI-specific regulation had not been in effect in Germany until July 2015[20], the local CI-market has evolved within the scope of the existing national securities laws. The German Securities Prospectus Act (WpPG, *Wertpapierprospektgesetz*) which requires the preparation of a prospectus for all security issuances that exceed 100,000 Euro within a 12-month

[18] Naturally, CIPs also differ in size (*i.e.*, the investor base and number of (simultaneous) issuances). As a high number of simultaneous issuances on a CIP might negatively affect the funding amount of each individual issuance, fund-seeking firms might, *ceteris paribus*, favour a CIP with a relatively small number of simultaneous fundings (Belleflamme *et al.* 2015).

[19] On its portal webpage (as of January 2015), *Companisto*, for example, provides rather general information on the criteria based on which it decides whether to host an issuance. It explains that it generally searches for *"innovative and scalable start-ups (...) whose business model distinguishes them from competitors because of its new ideas and unique selling points. Also, the project should be beyond the concept stage."*

[20] See footnote 11.

time interval (Section 3 (2) Sentence 1 No. 5 a.F. of the WpPG), has long prevented offerings above this threshold. However, starting in 2012, the largest German CIPs (including *Companisto*) switched from silent partnerships (*stille Beteiligungen*) to financial contracts that do not meet the legal definition of a security.[21] Specifically, by offering subordinated profit participating loans (*partiarische Nachrangdarlehen*), they managed to bypass the securities laws which allowed them to offer unlimited amounts within the scope of a single funding round (Klöhn and Hornuf 2012; Hornuf and Schwienbacher 2017)[22]. In this form of mezzanine financing, investors (do not) participate in the profits (losses) of a firm for a pre-defined holding period. Additionally, if the firm is sold within the holding period, investors receive a *pro rata* share of the acquisition price. In case that the firm has not been sold at the end of the participation period, the contract can be terminated by both parties, the start-up or the investors. Either way, investors receive a compensation that corresponds to their share in the re-evaluated firm value. The same procedure is followed in case of an exit after the end of the holding period (*e.g.*, the sale of a pre-specified share of the start-ups' equity). However, in contrast to equity shares, investors do not obtain any voting rights (Hornuf and Schwienbacher 2016b).

[Figure 2 about here]

[Figure 3 about here]

The (financial) information that *Companisto* requires fund-seeking firms to provide to potential investors includes general information on the product and the business model, which is presented in the "Overview"-Section of each listing. In addition, firms must create a pitch video in which the members of the managing board typically introduce themselves and the

[21] As almost all investments in the form of silent partnerships took place in 2012, in my empirical analysis, I find that the respective year dummy is highly positively correlated with the indicator variable that differentiates between the two different financial contracts (Bravais-Pearson correlation coefficient: 0.84). Moreover, as its inclusion does not significantly affect the main regression results (Table 8) in direction or statistical significance, I exclude the variable from my analyses.

[22] Note that the descriptions in the entire previous [following] paragraph are based on Klöhn and Hornuf (2012) as well as Hornuf and Schwienbacher (2017) [Hornuf and Schwienbacher (2016b)].

firm's business model. Moreover, *Companisto* requires each member of the managing team to provide a short profile with information on her (professional) background (see Figure 2). Furthermore, firms must provide (a discussion of the assumptions underlying) selected financial information (*e.g.*, EBIT forecasts) in the "Financial Data"-Section of each listing (see Figure 3). Start-ups that seek funding on *Companisto* are further required to determine a lower and upper bound for the capital sought in the scope of a funding round. The lower bound represents a threshold that must be reached for the funding to be successful. If the upper bound is reached, the funding round ends. Both, the lower and upper bound, are displayed to potential investors. This is also the case for the firm value, which is estimated by *Companisto*[23] and used as the basis for the calculation of the participation rate[24] (*i.e.*, the share of equity that investors obtain per five Euro invested). Additionally, *Companisto* encourages firms to provide regular news updates and timely responses to investor questions on the bulletin board.[25] In addition to firms' disclosure, each listing contains a separate section, in which all prior investments by other investors (*i.e.*, the investment date and amount, etc.) are disclosed.

[23] On its portal webpage (as of January 2015), *Companisto* explains that it conducts the valuation of the start-up firms on its own and that this process "*is influenced by a multitude of factors, which (...) [it has] developed in cooperation with corporate finance experts. These factors include, but are not limited to, the scalability of the business concept, the qualification of the management, the business plan, the market potential, the competitive situation, etc.".* However, *Companisto* has since changed its respective procedure in the sense that each start-up must now self-assess the value of its equity. Based on this valuation, *Companisto* negotiates with the start-up the lowest company value at which the start-up is willing to conduct a crowdinvesting.

[24] On *Companisto*, for example, firms generally offer five Euro tickets to investors (the minimum investment amount on *Companisto* has been raised to 100 Euro in June 2017). If the (pre-funding) value of the firm is determined to be 1,000,000 Euro and the maximum funding amount is set at 250,000 Euro, an investment of five Euro generally corresponds to a right on at least 0.0004 (5 / (1,000,000 + 250,000) percent of the future cash flows of the firm (Hornuf and Schwienbacher (2016b). Consequently, the effective participation rate decreases in the amount that has been funded in the scope of the issuance. However, the general terms are set by the start-up and are typically specified in the participation contract of each listing.

[25] It is important to note that messages on the issuance-specific bulletin boards do not automatically become public on *Companisto*. Instead, a firm can decide whether to make a request (and its own response message) visible to all investors. However, if the firm does not answer within a three-day window, the message automatically becomes public. Firms might take this decision strategically in the sense that they choose (not) to publish any form of (negative) positive information (*e.g.*, Verrecchia 1983). Consequently, the requests that are publicly visible on a listing's bulletin board should only represent a (biased) selection of all requests made in the scope of a funding round. Moreover, firms might use this private communication channel to disclose additional (potentially proprietary) information to certain investors that they may not want to share with the general public.

In contrast to many other countries, where only accredited investors are entitled to invest on CIPs[26], in Germany, CIPs are also open to non-accredited investors. Moreover, while minimum investments on other German CIPs typically start at 250 Euro, on *Companisto*, the minimum investment amount is five Euro.[27] This allows all investors to engage in crowdinvesting (Hornuf and Schwienbacher 2016b, 2017)[28].

3 Related Literature and Hypothesis Development

Despite CF being a relatively novel phenomenon, there already exists a large body of empirical evidence on factors associated with fundraising success (*i.e.*, the amount and frequency of contributions) in different forms of CF. However, most studies focus on donation or reward-based CF, where contributions are mainly driven by an intrinsic motivation and/or the promise to receive the product to be developed (see Moritz and Block 2016 for a more detailed discussion). More closely related to this study is the evidence on the behavior of capital providers in crowdlending (*i.e.*, peer-to-peer lending) markets, which suggests that objectively uninformative disclosures are associated with lending decisions (Duarte *et al.* 2012; Michels 2012). Specifically, the findings of Duarte *et al.* (2012) indicate that the interest rate that borrowers must pay is decreasing with their perceived trustworthiness. Of particular interest with regard to the focus of this study is the evidence provided by Michels (2012), who shows that voluntary and unverifiable disclosures made by borrowers in the scope of their loan listings on *Prosper.com* are negatively (positively) associated with the interest rate (the number of bids), indicating that lenders consider these disclosures when making lending decisions.

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[26] In some countries [*e.g.*, the U.S. where Title III of the JOBS Act (*i.e.*, "the Crowdfunding Act") has recently been adopted] start-up investments on CIPs are [were long] restricted to accredited investors (see SEC 2015, for an overview of the new regulation and Hornuf and Schwienbacher 2017 for a discussion of country-specific CI regulation).

[27] The maximum investment amount is individually set by each start-up and therefore varies across issuances. See Hornuf and Schwienbacher (2016b) for an overview of the specific business models applied by CIPs in Germany.

[28] Note that the descriptions in the entire previous paragraph are based on Hornuf and Schwienbacher (2016b, 2017).

The first study to empirically investigate the determinants of success of CI funding rounds is Ahlers *et al.* (2015). Using data from the Australian crowdinvesting site ASSOB, the authors show that firm (*e.g.*, the presence of a financial roadmap) and management attributes (*e.g.*, the share of board members that hold a MBA) are related to fundraising success, *i.e.*, the funding amount, the number of investors and the duration of financing rounds. This is consistent with the findings of Bernstein *et al.* (2017), who conduct a randomized field experiment in which they find that information on the founding team plays an important role in the selection process of accredited (crowd)investors. Other studies provide ambiguous evidence for the existence of behavioral biases (*i.e.*, herding) in the CI market (*e.g.*, Hornuf and Schwienbacher 2016b; Kim and Viswanathan 2016; Vismara 2017a). Closely linked to my study is the evidence provided by Hornuf and Schwienbacher (2016b), who use unmatched investment data (*i.e.*, individual anonymous investments that cannot be matched on the investor-level) gathered from three German CIPs to examine factors associated with the frequency and amount of investments. Their results suggest that the investment frequency increases after information updates and the investment by other investors. In line with this evidence are the results provided by Block *et al.* (2016) who find a positive association between funding success and the extent of information updates. Using hand-collected data from *Companisto*, the authors find that this effect varies with the content of the updates. Consistent with these findings is the evidence provided by Polzin *et al.* (2017). Using survey data, the authors find that the information provided in different types of crowdfunding campaigns is generally considered by funders in the scope of their investment decisions. For a small sub-sample of crowdinvesting-related investments, their evidence further indicates that the relevance of start-ups' disclosures varies with investor demographics and the investment amount.

Analytical disclosure research (see Beyer *et al.* 2010 for an overview and a more detailed discussion of the analytical disclosure literature) suggests that in the absence of (direct) costs of disclosure, investors are likely to ignore managers' unverifiable disclosures as they

consider them untruthful (Stocken 2000). However, Gigler (1994) shows that if the provided information is proprietary and its publication therefore costly, firms' voluntary disclosures can be credible. For early-stage ventures, whose distinct feature usually lies in an innovative business idea, specific information on the business model and its profitability should be proprietary in nature. Moreover, Stocken (2000) shows that in repeated cheap-talk games, firms can have incentives to build up a reputation for truthful disclosure (Beyer *et al.* 2010)[29]. On *Companisto* it is not uncommon for firms to repeatedly raise capital in the scope of several distinct funding rounds.[30] As their forward-looking financial disclosures are typically at least partially verifiable (in an *ex post* sense), firms might have an incentive to report truthfully (Belleflamme *et al.* 2015). In addition, the unaudited disclosures related to the background, education level and professional experience of members of the managing board can be to some extent verified before investing through an internet inquiry (*e.g.*, by examining the information provided on their private social media profiles). However, as the acquisition of information (additional to the disclosures made on the CIP) creates costs, it is not clear whether investors are always (*e.g.*, when they invest small amounts) willing to spend the required amount of time and money to conduct a due diligence (Agrawal *et al.* 2014; Hornuf and Schwienbacher 2016a). Nevertheless, in CI, where investors can share information through bulletin boards and the social media channels of the entrepreneurs and their firms, information acquisition becomes a collective effort. Building up on Surowiecki (2004), who refers to the underlying phenomenon as 'the wisdom of crowds', it would be sufficient if only one investor acquired and shared the respective information (Bradford 2012; Schwienbacher and Larralde 2012; Agrawal *et al.* 2014; Mollick and Nanda 2015). Moreover, as there is no secondary market for shares acquired on *Companisto*, investors have no clear incentive to withhold this information. Given that it is not unlikely that members of the personal networks of the entrepreneurial team screen the information provided

[29] Note that the discussion in the entire previous paragraph is based on Beyer *et al.* 2010.

[30] As of January 2015, from the 37 listings on *Companisto*, two represented second funding rounds of already listed firms.

on *Companisto*, misreporting might be detected and made public. As this should hurt the reputation of the entrepreneur(s) and the firm, misreporting should be costly (*i.e.*, negatively affecting the funding amount). Entrepreneurs should therefore have an incentive to report truthfully (*e.g.*, Stocken 2000).

The empirical research on disclosure suggests that market participants consider unverifiable (Price 2000; Leone *et al.* 2007; Michels 2012) and (thus) unaudited (*e.g.*, Hodge 2001; Mercer 2004) information in their decision-making. However, most empirical studies on (the capital market effects of) voluntary disclosure traditionally focus on firms publicly listed on established capital markets (Beyer *et al.* 2010; Michels 2012). Building up on Michels (2012), I argue that due to the systematic differences between (firms listed on) major stock exchanges and (firms listed on) CIPs, it is not clear to what extent this evidence relates to the results of the empirical analyses in the scope of this study. One reason for potential differences lies in the fact that due to the extensive mandatory disclosure requirements, voluntary information typically represents a relatively small fraction of the information environment of firms listed on regulated stock exchanges. Due to their lack in operating history and thus the absence of audited financial statements, the voluntary unaudited disclosures that firms provide on *Companisto* should, in contrast, reflect a large fraction of their overall information environment and should therefore be more relevant to potential investors. Moreover, while firms listed on established capital markets normally use multiple channels to (voluntarily) disclose their private information (*e.g.*, management calls, forward-looking report), in my setting, the CIP represents firms' primary channel to communicate with potential investors. Compared to many prior studies, this allows for a more complete measurement of firms' overall level of voluntary disclosure (Michels 2012)[31].

[31] Note that the discussion in the entire previous paragraph is based on Michels (2012), who conducts a comparable analysis in the peer-to-peer lending market.

Empirical research on the capital market effects of disclosure suggests that firms' voluntary disclosures reduce the degree of investors' estimation risk, which, under certain conditions, increases the likelihood of investments (*i.e.*, liquidity) (Beyer *et al.* 2010). However, given the structural differences compared to traditional capital markets (*e.g.*, the absence of a secondary market), in CI markets, the effects of disclosure might follow a different mechanism. Moreover, it is not clear whether investors generally regard firms' voluntary disclosures as sufficiently credible as to consider them in the scope of their investment decisions. Therefore, my first hypothesis (in alternative form) is:

H1: *Crowdinvestors' investment decisions are associated with the extent of firms' voluntary disclosures*

The selection criteria of risk capital providers, *i.e.*, venture capitalists (VCs) (McMillan *et al.* 1985, 1987; Hall and Hofer 1993; Kollmann and Kuckertz 2010) and business angels (BAs) (*e.g.*, Mason and Stark 2004; Maxwell *et al.* 2011), have been extensively studied. Since historical information on firm performance is usually unavailable, risk-capital providers must often rely on signals of quality (*e.g.*, the ability and personal characteristics of the management team) when evaluating start-up investments (Agrawal *et al.* 2014; Vismara 2017b). With the emergence of CI, non-professional retail investors are facing similar investment decisions as VCs and BAs (Mollick 2013).[32] As on most German CIPs, any full-aged individual with a working internet connection is just a few clicks away from an investment, crowdinvestors should, on average, be less sophisticated than business angels and venture capital investors, respectively (Fink 2012; Schwienbacher and Larralde 2012; Agrawal *et al.* 2014; Heminway 2014; Macht and Weatherston 2014; Kim and Viswanathan 2016). However, Mollick (2013) finds that capital providers in crowdfunding markets for technology entrepreneurships trust in similar quality signals as VCs (*e.g.*, entrepreneurial quality). Furthermore, the results of Mollick

[32] Note that the discussion in the entire following paragraph is based on Moritz and Block (2016).

and Nanda (2015) support the notion that there is a high degree of congruence in the evaluation processes of 'the crowd' and ('industry') experts. In their study, the authors conducted a survey in which 30 theater experts were asked to evaluate theater projects that had been previously up for funding on *Kickstarter*. The results were then compared with the actual funding decision of the crowd (see Moritz and Block 2016 for a more detailed discussion of the crowdfunding literature).

Capital market research generally suggests that investors systematically differ in their information behavior (see Cascino *et al.* 2013, 2014 for an overview and a more detailed discussion of the literature on the information behavior of different investor groups). A large part of this evidence stems from survey data suggesting that investors' usage and choice of information varies with their level of sophistication (*e.g.*, Ernst *et al.* 2005, 2009; Elliott *et al.* 2008). Experimental evidence further suggests that less sophisticated investors tend to ignore relevant information (*e.g.*, Coram 2010; Bhattacharya *et al.* 2012). Nevertheless, there is only little market-based evidence on the association between the quality of (non)financial information and the investment behavior of individual investors. Despite the high interest of both regulators and scholars in this field of research, the limited availability of investor-level trading data has long prevented researchers from directly addressing this question. A notable exemption is a study conducted by Lawrence (2013) who uses discount brokerage data on individual investors' trading behavior and demographics to show that retail investors invest more and obtain higher returns in firms with more concise and better readable financial disclosures and that these associations are less pronounced for investors with a professional background (Cascino *et al.* 2013, 2014)[33].

In sum, the empirical evidence on investors in traditional capital markets indicates that retail and institutional investors differ in their information preferences and ability to process

[33] Note that the discussion in the entire previous paragraph is based on Cascino *et al.* (2013, 2014).

information. To investigate whether these findings can also be observed in the crowdinvesting market, my second hypothesis (in alternative form) is:

H2: *Retail and institutional crowdinvestors differ with regard to the relation between their investment decisions and (the extent of) firms' voluntary disclosures*

4 Data and Research Design

4.1 Data

The dataset used in this study comprises information on the demographics (*e.g.*, age, gender, place of residency) and investments (including the date and amount) of 10,027 crowdinvestors registered at *Companisto* as of January 2015. The sample includes all investments (28,768) made on *Companisto* between June 2012 and January 2015 in the scope of 37 funding rounds of 35 unique firms.[34] Firms' narrative disclosures on *Companisto* are typically available in several languages. However, as some firms provide certain information (*i.e.*, the pitch-video) exclusively or differently in the German version of the CIP, I only include investments from German-speaking countries (*i.e.*, Austria, German or Switzerland). To exclude investments made by individuals, who are friends or family members of a fund-seeking entrepreneur, I exclude investors whose portfolio on the CIP comprises less than two distinct firms. If their primary motivation for registration is to support a friend or family member, it is likely that the first investment decision of friends and family members is taken independently from the information disclosed on *Companisto* (*e.g.*, Agrawal *et al.* 2014, 2015). Moreover, even if they are solely profit-oriented, investors that are part of the personal network of an entrepreneur are likely to have private information about the entrepreneur and/or the firm and are therefore excluded.

[34] Naturally, the number of crowdinvestings has increased since January 2015. However, I limit my sample to the crowdinvestings presented in Figure 5 because, for my sample period, the information environment on *Companisto* remained more or less unchanged. The subsequent crowdinvestings included several videos ("EBS Technologies" and "Freygeist"), no information in the "Team Section" ("EBS Technologies") or reflected the sale of fixed-interest (debt) securities which were issued to finance a movie ("Wie Männer über Frauen denken"). Finally, in April 2015, the German Retail Investor Protection Act (*Kleinanlegerschutzgesetz*) which significantly increased information requirements for crowdinvesting was passed. On *Companisto*, the increased disclosure requirements were already implemented before the new legislation came into effect in July 2015.

[Table 1 about here]

The main empirical analyses of this study are conducted on the transaction level with each observation representing a transaction in *t* that involves investor *i* and firm *j*. This allows me to explore differences across firms, individuals and time. As the main objective of this study is to examine the association between firms' disclosures and the likelihood of investments by crowdinvestors, my main dependent variable (*invested*) is coded binary with the value one indicating that investor *i* is invested in firm *j*. Since I cannot observe the decision of an investor not to invest in a firm, I am confronted with the problem of generating transactions (*i.e.*, investor-firm pairs) that reflect cases in which investors actively (*i.e.*, after screening the disclosed information) decide not to invest in a specific start-up. A straight-forward (naïve) approach to generate non-investments, *i.e.*, transactions for which the value of *invested* equals zero, would be to take each case in which an investor did not invest in a firm that was funded after she registered on *Companisto*. However, as it is possible that she was simply not active (anymore) during the funding period and did not receive or read the newsletter, I follow an alternative and more restrictive approach.

[Figure 4 about here]

[Figure 5 about here]

As illustrated in Figure 4, I generate a non-investment for investor *i* and firm *j*, if investor *i* does not (*i.e.*, neither before nor after her investment in firm *k*) invest in firm *j*, which is being funded at the same time as she invests in firm *k*. As there are typically more than two open fundings at a given point in time (see Figure 5), an investment in one firm can generally trigger the generation of more than one non-investment. To make an investment, investors must be logged on to *Companisto*. As the number of simultaneously funded firms does not exceed

five listings, the likelihood that investor *i* crosses and maybe even screens the information related to the funding of firm *j* is higher than in the naïve approach. Following this rationale, the date at which investor *i* invests in firm *k* is adopted as the transaction date for the non-investment of investor *i* in firm *k*. Thus, following this methodology, 26,081 non-investments are generated.

In a next step, all transactions related to the sale of debt securities are excluded. Moreover, as the first offering on the portal was conducted by *Companisto* itself, all related transactions (*i.e.*, investments and non-investments) are eliminated. Finally, all investor-firm pairs associated with second funding rounds of firms already listed on *Companisto* are excluded as the decision (not) to invest in these firms could be related to the first funding round. The final sample comprises 26,968 investor-firm pairs (*i.e.*, transactions) that represent combinations of 3,900 unique investors and 33 firms, including (11,173) 15,795 (non-)investments.

4.2 Measuring Firms' Disclosure

To investigate the association between firms' voluntary (and mostly forward-looking) financial) disclosures and crowdinvestors' investment decisions, I develop two indices that capture the extent of firms' disclosures related to financial information (*fin_discl*) and related to personal information on the managing team (*team_discl*). Additionally, to account for the overall level of firms' (narrative) disclosures, I control for the total number of words included in firms' narrative disclosures (*overall_discl*).[35] Building up on survey evidence suggesting that the pitch video plays an important role in crowdinvestors' decision-making (*e.g.*, Moritz *et al.* 2015), I further include the length of the pitch video (*vid_length*). The video typically contains

[35] Firms regularly provide information updates, which are not accounted for in the scope of this study as their disclosure might be affected by the funding-process (*e.g.*, the frequency and aggregated amount of investments, etc.) Nevertheless, as some studies show that the number and frequency of information updates by the firm is positively associated with crowdinvesting success, I run additional (untabulated) regressions including the number of updates at the investment date. However, as the number of updates is highly positively correlated with *%funded* (Bravais Pearson correlation coefficient: 0.72) and my main regression results (Table 8) do not significantly change in direction and statistical significance, I do not consider this variable in my analyses.

information on the managing team and the business model. Moreover, it provides investors with a personal impression of the entrepreneurial team (Moritz *et al.* 2015). Given that evidence from peer-to-peer lending indicates that appearance-based judgments are related to financial decisions (Duarte *et al.* 2012; Ravina 2012), the pitch video might be of particular relevance for those investors whose investment decisions are rather based on their gut feeling than on an extensive due diligence (Moritz *et al.* 2015; Guenther *et al.* 2015). All four disclosure variables are measured at the beginning of the crowdinvesting campaign.[36]

4.2.1 Financial Disclosure Index (fin_discl)

On *Companisto*, the requirements with regard to financial disclosures have been relatively constant over time (*i.e.*, across listings) and comprise selected financial items (*e.g.*, financial ratios) that are presented in a standardized form in the "Financial Data"-Section of each listing (see Figure 2). This further includes the firm value as estimated by *Companisto*.[37] Additionally, firms are required to provide forecasts of revenues and expenditures (and hence EBIT and return on sales forecasts) for the current and the four years subsequent to the funding round along with a discussion of the underlying assumptions.[38] However, there are no specific requirements regarding the contents of these disclosures.

All additional financial information is provided on a voluntary basis and mostly forward-looking in nature. These disclosures are not subject to any form of documented third-party verification.

[Table 2 about here]

[36] While firms provide regular information updates, they do normally not change the initial disclosures during the crowdinvesting campaign.

[37] See footnote 23.

[38] Depending on the timing of the crowdinvesting campaign, the first-year estimates might (to some extent) have already been realized at the beginning of the crowdinvesting and therefore do not (fully) reflect forward-looking information.

To test the association between these disclosures and crowdinvestors' investment decisions, I develop a financial disclosure index (*fin_discl*), which grades each listing with regard to the presence of selected financial information [*e.g.*, information on the application of the funds, key performance indicators (KPIs)[39], etc.] that is provided in addition to projected income and/or cash flow statements. For this purpose, I build up on accounting research on the quality of forward-looking disclosures of firms listed on established capital markets (*e.g.*, Marston and Shrives 1991; Wang *et al.* 2008; Barth 2009) to generate an initial list of items that are assumed to be decision-relevant for potential investors in my setting. In a next step, I drop all items on which all firms provide information. The final list comprises seven items for which at least one firm in the sample provided disclosures (see Table 2). One point is awarded for each presented item. The disclosure score (*fin_discl*) is then calculated on the firm-level as the (equally weighted) sum of all points.[40] Table 3 shows the summary statistics of (each component of) the financial disclosure index.[41]

[Table 3 about here]

4.2.2 Team Disclosure Index (team_discl)

Aside from a picture and links to their personal social media channels, the profiles of the board members typically include information on their demographics, their level of education and professional experience. However, as there are no requirements with regard to the structure and specific contents of these disclosures, the magnitude and depth of information provided in this section strongly varies across board members and firms, respectively (see Table 3).

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[39] This also includes non-financial KPIs.

[40] As there is no information on the relative information preferences of crowdinvestors, I use equal weights on all items included in the calculation of *fin_discl*. Some related studies that look at investors on traditional capital markets (*e.g.*, Barth 2009) weight disclosure items, for example, based on survey evidence on the information preferences of different capital market participants (*i.e.,* analysts and investors).

[41] For a correlation matrix of the different disclosure items, see Panel A in Appendix A2.

Analogously to the development of *fin_discl*, I generate a team disclosure index (*team_discl*) which grades each listing with regard to the presence of voluntarily disclosed information on members of the management board. One point is granted for each item disclosed that is related to the general interests, the level of education (*i.e.*, degree, place, and field of study) and the professional experience (*i.e.*, employer, industry and duration employed) of a board member. The total number of items (*i.e.*, the maximum score) is seven. For each firm, *team_discl* is then calculated as the (unweighted) average disclosure score per board member.[42]

4.3 Control Variables

Building up on prior research (Ahlers *et al.* 2015; Moritz *et al.* 2015; Hornuf and Schwienbacher 2016b; Block *et al.* 2017; Vismara 2017a), I further control for selected issuance attributes and funding dynamics.

As historical information on the performance of start-up firms is generally rare, signals of quality play an important role in reducing information asymmetries and overcoming market failure, respectively (Agrawal *et al.* 2014). Related evidence on the selection process of professional risk capital providers suggests that the attributes of the entrepreneurial team are key decision criteria for VCs and BAs (*e.g.*, Mason and Stark 2004).[43] Hence, the business skills of the firm's board members (*e.g.*, the ability to prepare consistent and reasonable financial forecasts) and their understanding of corporate law (*e.g.*, legal form, contract design, etc.) should, *ceteris paribus*, positively affect the development of a start-up firm. As this should hold irrespectively of a firm's industry, I include a binary variable that takes on the value one (zero) if at least one of the board members holds a degree in business or law (*team_buslaw*). Moreover, as industry-specific knowledge and/or work experience of a start-up's board members should,

[42] For a correlation matrix of the different disclosure items, see Panel B in Appendix A2.
[43] Note that the discussion in the entire following paragraph is based on Miloud *et al.* (2012) and Ahlers *et al.* (2015).

ceteris paribus, increase the likelihood of its future success, I further include an indicator variable that takes on the value one (zero) if at least one (no) member of the management board has already gained industry-specific experience at funding-start (*team_industry_exp*). Additionally, it might be helpful if at least one of a start-up's board members has already gained work experience (either as a founder or as an employee) related to early-stage ventures and might therefore be familiar with the key success and risk factors of early-stage ventures as well as key players in the (local) start-up community. I therefore include a binary coded variable that takes on the value one (zero) if at least one (no) member of the managing board has already gained start-up-related work experience (*team_start-up_exp*) (Miloud *et al.* 2012; Ahlers *et al.* 2015).[44]

Additionally, I include the ratio of the maximum funding amount and the sum of the firm value as calculated by *Companisto* and the maximum funding amount (*%eq_offered*). Investors might consider *%eq_offered* informative with regard to the firm's (expected) capital requirements (*i.e.*, investment opportunities). A high value of *%eq_offered* might thus be perceived as a positive signal with regard to the managing board's expectation regarding the firm's growth potential. However, a high value of *%eq_offered* could also raise concerns as to whether the managing board can efficiently employ the collected funds. Furthermore, the higher the value of *%eq_offered*, the lower the percentage of equity retained by the entrepreneurial team. A high value of *%eq_offered* could therefore also be regarded as a negative signal with regard to the managing boards' future commitment (Ahlers *et al.* 2015)[45].

Following Ahlers *et al.* (2015), I further control for the number of employees (*#staff*). A high value of *#staff* might be anticipated as an indicator of high (expected) revenues and/or a high capital base, which both should positively affect investors' assessment of the firm's quality. Moreover, a high number of employees suggests that the entrepreneurial team managed

[44] Several studies document that the (industry) experience and track record of the managing team represent important investment decision criteria for professional risk capital providers (see Maxwell *et al.* 2011 for an overview).

[45] Note that the discussion in the entire previous paragraph is based on Ahlers *et al.* (2015).

to convince many people of the firm's potential. However, a clear prediction with regard to the association between *#staff* and the investment propensity is not possible. The same holds for the number of years that a firm has been in business (*years_i_b*)[46], which could be anticipated as an indicator of the entrepreneurs' commitment. Nevertheless, in combination with other firm attributes [*e.g.*, a high (self-assessed) number of years to break even, etc.] a long operating history might also be anticipated as a bad signal regarding a firm's quality. In the absence of any prior investments from banks and/or other risk capital providers, a high value of *years_i_b* could further suggest that professional investors consider the firm as a bad investment. Consequently, for crowdinvestors that follow this line of thought, the share of capital provided by third parties should be positively linked to their investment propensity (Ahlers *et al.* 2015)[47]. Furthermore, as risk capital investors often provide not only financing, but also business advice (*e.g.*, Sapienza 1992), monitoring services (*e.g.*, Gompers 1995) and access to their business network (*e.g.*, Barry *et al.* 1990), professional investments might generally be regarded as a positive signal by investors. I therefore control for the share of equity held by VCs, BAs and other third parties at funding start (*%held_by_third*) (Ahlers *et al.* 2015). In addition, as the information based on which *Companisto* evaluates the firm might partially be proprietary and therefore not publicly disclosed, the assessed firm value should incorporate private information of the firm's management and should therefore be informative for investors. Hence, I control for the value of the firm as estimated by *Companisto* (*value*). Consistent with related evidence on the selection criteria of professional risk capital providers (*e.g.*, Häussler *et al.* 2012), I further control for another potential signal of quality, the presence of at least one patent (*patent*) (Ahlers *et al.* 2015).

[46] It is important to note that the number of years in business that is disclosed on *Companisto* (and thus the duration used in this study) relates to the number of years that a firm has been operating under its legal form (*e.g.*, limited liability company) as of the start of the funding round. The actual number of years in business might therefore be larger.

[47] Note that the discussion in the entire previous paragraph is based on Ahlers *et al.* (2015).

Another aspect that might affect crowdinvestors' investment decisions is whether firms grant non-monetary rewards for investments above or equal to certain pre-defined thresholds. I therefore include a binary coded variable (*rewards*) with one indicating that rewards are granted in return for investments, which applies to 13 firms in the sample.

Apart from firm attributes, I account for potential effects of the funding dynamics on crowdinvestors' investment decisions. Behavioral biases such as herding, for example, whose presence has been extensively documented in finance research (*e.g.*, Scharfstein and Stein 1990; Sias 2004), might be of particular relevance in CI markets, where firms have a generally low overall information environment. However, while this phenomenon seems to be present in the scope of peer-to-peer lending (Herzenstein *et al.* 2011; Lee and Lee 2012), the evidence in crowdinvesting markets is ambiguous (Hornuf and Schwienbacher 2016b; Kim and Viswanathan 2016; Vismara 2017a). To account for the effect of prior investments on crowdinvestors' investment propensity, I include *%funded*, which represents the ratio of aggregated fundings on the investment date and the total funding amount.[48]

Given that investors' wealth and time is limited, the propensity of an investment in a firm should be negatively associated with the opportunity set on the CIP. I therefore control for the number of open fundings on the investment date (*opp*). Capital market research further indicates that limited attention affects the investment behavior of retail investors (*e.g.*, Hirshleifer and Teoh 2003). However, whether this phenomenon is present in CI markets, in which the number of simultaneous fundings and the frequency of information events (*i.e.*, information updates, new fundings, etc.) are relatively low, is questionable.

Lastly, I include a binary coded variable (*hist_fin_stat*) with one (zero) indicating that, at the investment date, historical financial statements of the firm are (not) publicly available

[48] My main regression results w.r.t. the different disclosure measures (Table 8) remain unchanged in direction and statistical significance if I use the ratio of accumulated investments and the maximum sought capital as a proxy for the funding process.

through the online-platform of the Federal Gazette. Given the fast-changing nature of early stage firms' financial situation and the fact that small firms have up to 12 months after the end of fiscal year to file the required disclosures, the balance sheet information might not be very informative with regard to the current financial situation of the firm. Still, it might give an insight into firms' capital structure, *i.e.*, the (relative) amount of debt, information that is typically not included in firms' financial disclosures on *Companisto*. Although the financial statements do not have to be audited, they are legally mandated and must be prepared in accordance with the German Commercial Code (HGB). The information should therefore be considered as more reliable to potential investors than firms' unaudited (and mostly forward-looking) voluntary financial disclosures provided on the CIP. Nevertheless, compared to the financial (statement) information on the CIP, firms' historical financial statements are typically outdated and might therefore be regarded as less relevant (*i.e.*, less informative with regard to the future financial position of the firm) by investors. However, the historical balance sheet information might be used by investors to assess of the assumptions underlying firms' financial forecasts on *Companisto* (see Hand 2005 for a related discussion).

4.4 Model

The focus of this study lies on the association between *invested*, the dependent variable, and the four disclosure measures (*i.e.*, *overall_discl*, *fin_discl*, *team_discl and vid_length*). Model (1) tests H1's prediction that there is an association between firms' voluntary disclosures and the investment propensity of crowdinvestors:[49]

$$\begin{aligned} invested_{i,j,t} = {} & \beta_0 + \beta_1\, overall\_discl_j + \beta_2\, fin\_discl_j + \beta_3\, team\_discl_j + \beta_4\, vid\_length_j \\ & + \beta_5\, hist\_fin\_stat_{j,t} + \beta_6\, opp_t + \beta_7\, \%funded_{j,t} + \beta_8\, \%eq\_offered_j \\ & + \beta_9\, \%held\_by\_third_j + \beta_{10}\, value_j + \beta_{11}\, years\_i\_b_j + \beta_{12}\, years\_2\_be_j \\ & + \beta_{13}\, patents_j + \beta_{14}\, rewards_j + \beta_{15}\, team\_buslaw_j \\ & + \beta_{16}\, team\_industry\_exp_j + \beta_{17}\, team\_start\text{-}up\_exp_j + \beta_{18}\, \#staff_j + \varepsilon_{i,j,t} \end{aligned} \quad (1)$$

[49] See Appendix A1 for a definition of the regression variables.

To control for the effect of firm attributes and funding dynamics on the investment propensity, I include all variables introduced in the previous section as controls. I conduct the analysis on the transaction-level with each observation representing a transaction in *t* that involves investor *i* and firm *j*.

5 Results

5.1 Descriptive Statistics and Correlations

5.1.1 Investor-Level

Table 4 reports the sample composition (investor attributes) by investor type (as of January 2015). As shown in Panel B, 67.49 percent of the retail investors are aged between 20 and 39 years.[50] Only a small share of investors (1.90 percent) are registered as a "company". Summary statistics of investor attributes (see Table 5) show that the mean (median) age of retail investors is 36.30 (34.22). Most retail investors (89 percent) are *male* (= 1). As of January 2015, the average (median) duration that investors have been registered on *Companisto* (*exp*) amounts to 74.07 (72.57) weeks. The mean (median) portfolio size (*pfsize*, *i.e.*, the number of unique firms in the portfolio) is 4.72 (3.00). Both, Pearson and Spearman correlations for *age* and *Øamount* are statistically significant and positive for retail investors (see Table 5, Panel B). Analogously, the evidence presented in Panel B of Table 4 shows that the share of investments equal to or above 500 Euro is increasing in the age of retail investors. The average amount invested by institutional investors (1,274.25 Euro) is more than three times as high as the average amount invested by retail investors (438.18 Euro).

[Table 4 about here]

[Table 5 about here]

[50] Calculated as the sum of investors aged between 20 and 39 years (2,582) divided by the total number of investors (3,900).

5.1.2 Firm-Level

Table 6 reports summary statistics and correlations for firm attributes. The mean (median) value of *fin_discl* is 3.70 (4) with a standard deviation of 1.79. The (lowest) highest score is (0) 6 out of 7. In contrast, *team_discl* has a mean (median) of 4.26 (4.33) with a standard deviation of 0.80. The (lowest) highest score is (2.33) 5.67 out of 9.

[Table 6 about here]

There are strong correlations among several of the disclosure measures (see Table 6, Panel B). Using a two-tailed test, I find that for *fin_discl*, the estimated Bravais-Pearson correlation coefficients with *overall_discl* (0.540) and *vid_length* (0.424) are positive and statistically significant, while *team_discl* and *hist_fin_stat* are both not correlated with the other disclosure measures.

5.1.3 Transaction-Level

Panel A in Table 7 reports summary statistics for all regression variables on the transaction-level. Specifically, only investments (*i.e.*, transactions with *invested* equal to one) are included to illustrate differences in portfolio-weighted [*i.e.*, by using the relative investment amount as a weight for each investor-firm pair (*i.e.*, investment)] firm and transaction attributes between investments made by retail and institutional investors. Consistent with H2, the table shows that, in comparison to retail investors, institutional investors invest in firms that, on average, disclose more narrative disclosures, provide more information on selected financial items and on the managing team and have longer pitch videos. For these variables, mean differences are statistically significant at the 0.1 level (or lower) using two-tailed tests.

[Table 7 about here]

Panel B in Table 7 reports Bravais-Pearson correlations of the main variables of interest on the transaction-level. The correlations between *invested* and *overall_discl*, *vid_length* as well

as *hist_fin_stat* are statistically significant ($p < 0.1$), with the association being negative for *overall_discl* (-0.115) and *hist_fin_stat* (-0.051). In contrast, for *fin_discl* and *team_discl*, I don't find a statistically significant correlation with *invested*. Conversely, the correlations between the investment amount (*amount*) and the disclosure measures are statistically significant ($p < 0.1$) and positive for *overall_discl* (0.015), *fin_discl* (0.040) and *vid_length* (0.049) and negative for *team_discl* (-0.012). For *hist_fin_stat*, I find no statistically significant correlation with the investment amount.

5.2 Regression Results

5.2.1 Main Analyses

[Table 8 about here]

To test H1, I run OLS regressions[51] of different specifications of model (1) that vary with regard to the employed explanatory variables and fixed effects structures (see Table 8). The results for specification (1) which solely includes the different disclosure measures, suggest that there is no strong association between crowdinvestors' investment decision and start-ups disclosures on *Companisto* (Column 1). While I find a negative and statistically significant association for the overall magnitude of narrative disclosures (in almost all specifications), the estimated coefficients on the other disclosure measures are not statistically significant. However, once I include the previously introduced set of control variables along with country- and year-fixed effects (see Column 2), I find stronger support for H1 as the estimated coefficients on *fin_discl*, *team_discl* and *vid_length* are all positive and statistically significant. Consistent with related evidence (*e.g.*, Ahlers *et al.* 2015; Moritz *et al.* 2015; Bernstein *et al.* 2017), my results suggest that crowdinvestors are more likely to invest in firms that provide more information on selected financial items, more background information on the managing team as well

[51] I estimate OLS regressions rather than Logit or Probit models to avoid incidental parameter problems given the extensive use of fixed effects.

as longer pitch videos. The negative association between *invested* and the overall magnitude of narrative disclosures (in almost all specifications) indicates that, consistent with Lawrence (2013), crowdinvestors' investment propensity is decreasing in the complexity (*i.e.*, length) of firms' disclosures.[52]

In a next step, I further extend model (1) by introducing an indicator variable (*type*) that, in specifications (3) and (4), takes on the value one (zero) for "company" ("private") investors. To account for differences between retail and institutional investors in the association between *invested* and the disclosure measures, and thus to test H2, I interact *type* with all explanatory variables (Column 3).[53] In addition, to control for the effect of all other time-invariant investor attributes on the investment propensity, I re-estimate the fully interacted model including investor-fixed effects (Column 4). Consistent with H2, I find that both retail and institutional investors are more likely to invest in firms that provide more financial information and more information on the managing team with the two associations being more pronounced for institutional investors. However, while the statistically significant estimated coefficient on *vid_length* remains positive, the negative and statistically significant estimated coefficient on the interaction of *type* and *vid_length* suggests that this association is less pronounced for institutional investors.[54] Taken together, the empirical evidence suggests that both retail and institutional investors' investment propensity is increasing in the magnitude of selected (and mostly forward-looking financial) information that firms provide on *Companisto*. More importantly, compared to retail investors, institutional investors seem to rely more (less) on 'hard' ('soft') information when making an investment decision. My findings therefore support both H1 and H2.

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[52] For the full regression results (including the estimated regression coefficients on the control variables), see Appendix A3.1.

[53] This allows the association between firms' information environment (*i.e.*, all types of information that firms disclose on the CIP) and crowdinvestors' investment decisions to vary with investors' sophistication level.

[54] In an additional regression, I find that, for the sub-sample of institutional investors, there is no statistically significant association between *invested* and *vid_length* (see Appendix A4.2).

To exploit differences in retail investors' attributes that potentially affect their investment behavior, I first drop transactions related to institutional investors and then employ *type* as an indicator for retail investors that, at the time of (non)investment in firm *j*, have already invested in equal to or more than five distinct start-ups[55] on *Companisto* (= *type* equal to one; zero otherwise). This allows me to investigate the extent to which the level of crowdinvesting experience (on *Companisto*) affects retail investors' investment behavior. The results of this regression are presented in Column 5 (Table 8). While I don't find differences regarding the association between the investment propensity and the magnitude of financial (*fin_discl*) or team disclosures (*team_discl*), my results indicate that the pitch video seems to be less relevant for the investment decisions of more experienced retail investors, indicating that the weight that crowdinvestors place on rather 'soft' information decreases with their level of crowdinvesting experience. This is consistent with the evidence provided by Bernstein *et al.* (2017), who find that investors' information preferences vary with their level of crowdinvesting experience.

Finally, to test whether retail investors that, on average, invest higher investment amounts differ with regard to their investment behavior, I use *type* (= one) as an indicator for investors that invest equal to or more than 500 Euro on average (zero otherwise). Although I cannot observe the personal wealth of each investor, the idea is to distinguish between transactions that represent profit-oriented investments from contributions that follow another motivation (*e.g.*, support for a team and/or an idea).[56] The regression results (Column 6) indicate that investors with high average investment amounts rely relatively more on financial information than investors that invest less than 500 Euro on average. In contrast, the estimated coefficient for the interaction of *type* and *vid_length* is statistically insignificant indicating that the role of

[55] The regression results presented in Appendix A3.2 show how my results vary with different cutoffs of *pfsize*.
[56] In Appendix A3.2, the regression results for varying cutoffs of *Øamount* are presented.

'soft' information in retail investors' decision-making does not vary with their average investment amounts.

Taken together, the results presented in this section indicate that both retail and institutional crowdinvestors consider firms' unaudited voluntary disclosures in their decision-making. Compared to retail investors, institutional investors seem to rely less (more) on relatively 'soft' ('hard') information. For the sub-sample of retail investors' investment decisions, my evidence is consistent with the relevance of 'soft' information (financial information) to be decreasing (increasing) with their level of crowdinvesting experience (their average investment amount).

While there are differences across specifications, the evidence presented in Table 8 further indicates that the presence of publicly available historical financial statements (*hist_fin_stat*) is negatively associated with crowdinvestors' investment decisions.[57]

5.2.2 Retail Investor Demographics

[Table 9 about here]

To explore how retail investors' investment behavior varies with their demographical characteristics, I drop all transactions related to institutional investors. In a first step, I run a regression in which I use *type* to differentiate between investments by male (*type* = 1) and female (*type* = 0) investments (see Table 9, Column 1). While the investment decisions of both

[57] As the presence of legally mandated historical financial statements might affect crowdinvestors' usage and assessment of firms' voluntary disclosures on *Companisto*, I exclude all transactions related to firms with historical financial statements available through the online-platform of the Federal Gazette and re-estimate the different specifications of model (1). Columns 3 and 4 in Appendix A4.1 report the pooled sample results for the fully specified (interacted) model. In contrast to the results for the full sample (Table 8, Column 4), the estimated coefficient on *team_discl* is not statistically significant. The same holds for the estimated coefficients on *overall_discl*, *fin_discl* and *team_discl* in the retail investor sample (Columns 5 and 6), which all have the same direction as the corresponding evidence presented in Table 8, but are not statistically significant. Only the estimated coefficients on *vid_length* remain unchanged in direction and general statistical significance across all specifications. While the relatively high t-statistics suggest that the differences to the evidence presented in Table 8 might reflect a power issue, the results could also indicate that, in the absence of historical financial statements, investors place less weight on firms' voluntary disclosures on *Companisto*. For the sub-sample of institutional investors, however, I find no differences to the full sample results in the direction and statistical significance (*i.e.*, $p < 0.1$) of the estimated coefficients on all disclosure variables (see Appendix A4.2).

male and female investors appear to be positively associated with the presence of selected financial disclosures (*fin_discl*), the association is less pronounced for male investors. Analogously, while the likelihood of investments by all retail investors is negatively associated with *hist_fin_stat*, the link is less negative for male investors.

In a second step, I run sub-sample regressions for different age groups of retail investors (see Table 9, Columns 2 to 6). In all specifications, I employ *type* as an indicator to differentiate between investors that have invested in equal to or more than (less than) five distinct start-ups. My results indicate that across all age groups there exists a positive and statistically significant relation between investors' investment decisions and *fin_discl*, *team_discl* and *vid_length* for less crowdinvesting experienced investors (*i.e.*, type = 0). However, in the sub-samples of investors that are older than 30 years, the interaction effect of type and *vid_length* is negative and statistically significant, suggesting that the pitch video is less relevant for more experienced crowdinvestors (*type* = 1) (see Table 9, Columns 4 to 6). The respective age groups appear to be driving the previously presented evidence for the full sample of retail investors (see Table 8, Column 5).

Taken together, the evidence presented in Table 9 supports the notion that crowdinvestors are heterogeneous in their investment behavior. Specifically, I find that the extent to which the level of crowdinvesting experience affects the investment behavior varies across different age groups of retail investors.

5.2.3 Determinants of the Investment Amount

Given that not only the decision to invest but also the amount that investors are willing to invest in a specific firm might be positively related to the extent of its disclosure on the CIP (*e.g.*, Ahlers *et al.* 2015), I conduct an additional analysis based on model (1) with the natural logarithm of the investment amount (*amount*) as the dependent variable. If start-ups' disclosures

on *Companisto* decrease information asymmetry and therefore increase the likelihood of investments, the same might hold for the investment amount. This should be the case if the investment decision reflects a continuous rather than a binary coded variable with the investment amount (relative to their wealth) representing the quality of investors' investment decision. Following this rationale, I expect the investment amount to be positively associated with the extent of firms' disclosures on *Companisto*. However, as I already investigated the link between the investment propensity and firms' disclosures, I exclude all non-investments (*i.e.*, *amounts* equal to zero) from my sample. While the results of my analysis must therefore be interpreted with caution (*i.e.*, as conditional on investing), an advantage of this procedure is that, statistically, there should be no link between the two analyses. Obviously, the association might also go in the other direction, *i.e.*, it might be that investors information acquisition varies with the amount that they (plan to) invest.

[Table 10 about here]

Analogously to the results with the investment decision as dependent variable and consistent with related evidence (*e.g.*, Ahlers *et al.* 2015), the investment amounts of both retail and institutional investors are increasing in firms' unaudited voluntary disclosures with the association being more pronounced for institutional investors (Table 10, Columns 4 and 5). Moreover, I find that the amount invested by (institutional) retail investors is (not) positively associated with the length of the pitch video.[58] Finally, for retail investors, I find that the association between the investment amount and my financial disclosure index is stronger for more experienced investors.

[58] In an additional untabulated regression, I find that, for the sub-sample of institutional investors, there is no statistically significant association between *log(amount)* and *vid_length*.

5.2.4 Retail Investor Demographics and the Investment Amount

[Table 11 about here]

In a next step, I investigate how retail investors' demographics and their level of crowdinvesting experience mitigate the association between their investment amounts and firms' disclosures. For this purpose, I re-run sub-sample regressions for the sample of retail investors with *amount* as dependent variable (see Table 11).

Consistent with the evidence presented in Table 8, I find that retail investors' age and gender is associated with their investment behavior. Specifically, for (fe)male retail investors I find (no) a positive association between their investment amounts and the presence of selected financial disclosures (*fin_discl*). For investors aged below 20 (20 to 29), I find a positive association between their investments amounts and *team_discl* (*fin_discl*) only for the group of more experienced investors (*i.e.*, with *pfsize* ≥ 5). Moreover, for investors aged 50 or above, I find that *team_discl* (*vid_length*) is only (not) associated with the investment decisions of crowdinvesting experienced investors.

While this evidence suggests that not only the investment decision but also the investment amount varies with investors' demographics and their level of crowdinvesting experience, it is important to keep in mind that the average investment amount systematically varies with investors' demographics (see Panel B in Table 4).

5.3 Limitations

As this study uses proprietary data from a single source, the presented evidence must be interpreted with caution. In particular, the sample selection that results from the use of data from a single German crowdinvesting portal should be considered, when determining how the results of this study might generalize. Moreover, it is possible that any association that I find between my disclosure measures and the investment decisions (amounts) of crowdinvestors is

driven by omitted firm characteristics. Given the fact that firms' disclosure level should (also) reflect their assessment of the potential costs (*e.g.*, proprietary costs) and benefits (*e.g.*, lower of disclosure) of additional disclosure, my findings might mainly reflect investors' preferences with regard to the determinants of firms' disclosure choice (*e.g.*, the structure of their target market). Analogously, firms' primary motivation to engage in crowdinvesting (*e.g.*, for market research or financing), (i) should be related to their characteristics and (ii) might affect their disclosure strategy. Taken together, due to the potentially endogenous nature of my explanatory variables (*i.e.*, my disclosure measures), my results remain descriptive in nature and do not allow for any causal inference.

6 Conclusion

This study uses proprietary investor-level data from *Companisto*, one of the largest German crowdinvesting portals, to examine the role of firms' voluntary disclosure for investment decisions in the crowdinvesting market. Specifically, I extend the existing crowdinvesting literature by showing how crowdinvestors' actual investment behavior (*i.e.*, their decision to invest as well as the investment amount) varies with their demographics, their level of sophistication and their crowdinvesting experience. My findings suggest that both, retail and institutional investors, are more likely to invest in firms that provide higher levels of financial disclosures and information on the managing team. In contrast to institutional investors, the investment propensity of retail investors is also increasing in the extent of firms' 'soft' disclosures (*i.e.*, the length of the pitch videos). My results further indicate that retail investors are heterogeneous in their investment behavior. Specifically, I find that the link between the investment decision and firms' disclosures varies with retail investors' age, gender and level of crowdinvesting experience. My evidence is consistent with the relevance of 'soft' information (financial information) to be decreasing (increasing) with their level of crowdinvesting experience (their average investment amounts). Furthermore, the results of an additional analysis reveal that not

only the decision to invest, but also the investment amount is increasing in the extent of firms' voluntary (financial) disclosures.

A Appendix

A1 Variable Definitions

Variable	Definition
t	Date at which investor i has (not) invested in firm j (firm l, which was up for funding at the same time as investor i invested in firm j)
Transaction Attributes	
$invested_{i,j,t}$	Indicator variable equal to one (zero) if investor i is (not) invested in firm j in t
$(log)amount_{i,j,t}$	(Natural logarithm of) Amount that investor i invested in firm j in t
opp_t	Number of firms that are simultaneously up for funding at t
$\%funded_{j,t}$	Ratio of cumulative investments in firm j at t over maximum sought capital
Investor Attributes	
$type_i$	Binary coded variable indicating the investor type. Depending on the respective specification of model (1) a value of 1 (0) indicates (a) that the investor is registered as "company" ("private") as of January 2015; (b) that a "private" investor has invested in equal to or more (less) than five distinct start-ups or (c) that a "private" investor has, on average, invested equal to or more (less) than 500 Euro per start-up-investment
$country_{i,t}$	Country of residency of investor i at t
$age_{i,t}$	Age of investor i at t
$male_i$	Indicator variable equal to one (zero) if investor is male (female)
$transactions_{i,t}$	Number of transactions investor i has proceeded on *Companisto* at t
$pfsize_{i,t}$	Number of unique start-ups investor i holds in her portfolio at t
$exp_{i,t}$	Number of weeks that investor i has been registered on *Companisto* at t
$Øamount_i$	Amount that investor i has invested, on average, per start-up-investment between registration on *Companisto* and January 15, 2015
Firm Attributes	
$overall\_discl_j$	Magnitude of disclosures that firm j provides on *Companisto* at funding-start, measured as total number of words (divided by 1,000 for the multivariate regression analyses)
fin_discl_j	Financial disclosure index, measured as the sum of points awarded for the presence of disclosures on seven items related to financial information (1 point for each item disclosed)
$team\_discl_j$	Team disclosure index, measured as the sum of points awarded for the presence of disclosures on seven items related to information on the managing board (1 point for each item disclosed) divided by the number of board members
vid_length_j	Length of the pitch video measured in minutes
$hist\_fin\_stat_{j,t}$	Indicator variable equal to one (zero) if unaudited financial statements of firm j were (not) publicly available through the online-platform of the Federal Gazette (Bundesanzeiger) at t; this includes both published and deposited financial statements

A1 Variable Definitions *(continued)*

Variable	Definition
$\%eq\_offered_j$	Maximum share of equity offered by firm *j* in the scope of the funding round, measured as the ratio of the maximum sought capital and the sum of the firm value as estimated by *Companisto* and the maximum sought capital (in percent)
$\%held\_by\_third_j$	Share of equity held by third parties (*e.g.*, Venture Capitalists, Business Angels) at funding-start (in percent)
$(log)value_j$	(Natural logarithm of) Value of firm *j* as estimated by *Companisto* at funding-start (in Euro)
$years\_i\_b_j$	Years since foundation of firm *j* at funding-start
$years\_2\_be_j$	(Estimated) Years to break-even of firm *j* at funding-start
$rewards_j$	Indicator variable equal to one if firm *j* offers rewards in return for investments that exceed certain (predefined) amount thresholds, and zero otherwise
$team\_buslaw_j$	Indicator variable equal to one (zero) if at least one (no) management board member holds a degree in business, economics and/or law
$team\_industry\_exp_j$	Indicator variable equal to one (zero) if at least one (no) member of the management board has already gained industry-specific work experience at funding-start
$team\_start\text{-}up\_exp_j$	Indicator variable equal to one (zero) if at least one (no) member of the management board has already gained start-up-related work experience at funding-start
$patent_j$	Indicator variable equal to one (zero) if the company holds at least one (no) patent at funding-start
$\#staff_j$	Number of staff firm *j* employs at the funding-start

A2 Correlations of disclosure items

Panel A: Correlations – Financial Disclosure Index (*fin_discl*) components

N = 33	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) *applic_funding*		0.103	**0.669**	0.108	**0.607**	**0.594**	**0.433**
(2) *kpi*	0.103		-0.179	0.134	**0.298**	0.229	0.134
(3) *rev_sources*	**0.669**	-0.179		0.134	**0.298**	0.229	0.000
(4) *rev_sensitivity*	0.108	0.134	0.134		0.066	0.182	0.250
(5) *exp_breakdown*	**0.607**	**0.298**	**0.298**	0.066		**0.360**	0.263
(6) *cf_info*	**0.594**	0.229	0.229	0.182	**0.360**		**0.729**
(7) *cf_activities*	**0.433**	0.134	0.000	0.250	0.263	**0.729**	

Panel B: Correlations – Team Disclosure Index (*team_discl*) components

N = 33	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) *interests*		-0.279	**-0.335**	**-0.294**	-0.003	-0.062	-0.037
(2) *educ_place*	-0.287		**0.664**	0.195	-0.086	-0.244	0.219
(3) *educ_field*	**-0.362**	**0.645**		0.162	0.206	-0.145	0.100
(4) *educ_degree*	**-0.332**	0.199	0.257		-0.268	0.000	-0.265
(5) *exp_industry*	-0.032	-0.116	0.078	-0.193		0.074	0.246
(6) *exp_duration*	-0.066	-0.280	-0.195	-0.009	0.111		-0.007
(7) *exp_employer*	-0.043	0.251	0.082	-0.166	0.201	0.025	

Notes: This table provides correlations among the items included in the Financial Disclosure Index (Panel A) as well as the items included in Team Disclosure Index (Panel B). In both panels, statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. Pearson's correlation coefficients are shown in the lower triangle while Spearman's rank correlations appear above the diagonal. See Appendix A1 for the variable definitions.

A3 Full sample regressions

A3.1 Complete regression results

Panel A: Disclosure Measures

Dependent variable = invested						
Sample	Pooled Sample				Retail Investors	
Investor Type (for which *type* equals 1)	-		Institutional		*pfsize* ≥ 5	*Øamount* ≥ € 500
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.079**	-0.044**	-0.044**	-0.038**	-0.027	-0.037*
	(-2.482)	(-2.195)	(-2.197)	(-2.050)	(-1.389)	(-2.036)
*type * overall_discl*			0.019	0.009	0.003	0.001
			(0.640)	(0.238)	(0.114)	(0.054)
fin_discl	-0.005	0.062***	0.061***	0.068***	0.073***	0.062***
	(-0.177)	(3.440)	(3.372)	(3.848)	(4.096)	(3.724)
*type * fin_discl*			0.043**	0.053**	-0.015	0.037***
			(2.445)	(2.663)	(-0.769)	(3.172)
team_discl	0.012	0.050**	0.049**	0.046**	0.054**	0.047**
	(0.292)	(2.312)	(2.275)	(2.370)	(2.649)	(2.618)
*type * team_discl*			0.032	0.038*	-0.030	-0.009
			(1.395)	(1.939)	(-1.594)	(-0.638)
vid_length	0.061	0.069***	0.069***	0.070***	0.083***	0.073***
	(1.499)	(3.436)	(3.453)	(3.591)	(4.186)	(4.043)
*type * vid_length*			-0.042*	-0.053**	-0.053***	-0.016
			(-1.949)	(-2.346)	(-3.534)	(-1.352)
hist_fin_stat	-0.026	-0.048	-0.047	-0.064*	-0.066*	-0.053
	(-0.289)	(-1.151)	(-1.115)	(-1.702)	(-1.707)	(-1.530)
*type * hist_fin_stat*			-0.105**	-0.112**	-0.033	-0.078**
			(-2.506)	(-2.444)	(-0.717)	(-2.349)
Country FE		Yes	Yes			
Year FE		Yes	Yes	Yes	Yes	Yes
Investor FE				Yes	Yes	Yes
Obs.	26,968	26,968	26,968	26,968	26,467	26,467
Investments	*15,795*	*15,795*	*15,795*	*15,795*	*15,493*	*15,493*
Non-Investments	*11,173*	*11,173*	*11,173*	*11,173*	*10,974*	*10,974*
adj. R^2	2.58%	45.20%	45.20%	41.80%	42.80%	42.00%

A3.1 Complete regression results (*continued*)

Panel B: Control Variables

Dependent variable = invested						
Sample	Pooled Sample				Retail Investors	
Investor Type (for which *type* equals 1)	-		Institutional		*pfsize* ≥ 5	*Øamount* ≥ € 500
	(1)	(2)	(3)	(4)	(5)	(6)
team_buslaw		-0.076*	-0.075*	-0.079*	-0.107**	-0.091**
		(-1.764)	(-1.724)	(-1.966)	(-2.555)	(-2.445)
*type * team_buslaw*			-0.081**	-0.069	0.014	0.048*
			(-2.151)	(-1.691)	(0.355)	(1.896)
team_industry_exp		0.050	0.048	0.044	0.052*	0.041
		(1.625)	(1.550)	(1.511)	(1.767)	(1.483)
*type * team_industry_exp*			0.051	0.047	-0.062*	0.034*
			(1.397)	(1.169)	(-1.861)	(1.754)
team_start-up_exp		-0.015	-0.017	-0.021	-0.040	-0.020
		(-0.313)	(-0.339)	(-0.423)	(-0.870)	(-0.439)
*type * team_start-up_exp*			0.128**	0.130**	0.048	-0.007
			(2.584)	(2.141)	(1.435)	(-0.239)
%held_by_third		0.000	0.000	0.001	0.001	0.001
		(0.313)	(0.327)	(0.506)	(0.667)	(0.491)
*type * %held_by_third*			-0.003**	-0.003**	-0.001	0.001
			(-2.176)	(-2.059)	(-0.729)	(0.658)
log_value		0.146**	0.146**	0.172***	0.205***	0.164***
		(2.665)	(2.649)	(3.439)	(3.677)	(3.566)
*type * log_value*			-0.029	-0.007	-0.107*	0.056*
			(-0.423)	(-0.080)	(-1.884)	(1.736)
years_i_b		0.039*	0.038*	0.041**	0.044**	0.040**
		(1.899)	(1.854)	(2.143)	(2.199)	(2.274)
*type * years_i_b*			0.071***	0.075***	-0.003	0.013
			(3.132)	(3.144)	(-0.158)	(0.837)
years_2_be		0.090**	0.089**	0.099**	0.108***	0.098***
		(2.266)	(2.240)	(2.555)	(2.762)	(2.762)
*type * years_2_be*			0.030	0.038	-0.033	0.017
			(0.718)	(0.943)	(-0.961)	(0.569)
patent		-0.163*	-0.160*	-0.178**	-0.205**	-0.174**
		(-2.012)	(-1.964)	(-2.279)	(-2.391)	(-2.391)
*type * patent*			-0.204**	-0.271**	0.111	-0.069
			(-2.135)	(-2.441)	(1.132)	(-1.220)
Country FE		Yes	Yes			
Year FE		Yes	Yes	Yes	Yes	Yes
Investor FE				Yes	Yes	Yes
Obs.	26,968	26,968	26,968	26,968	26,467	26,467
Investments	*15,795*	*15,795*	*15,795*	*15,795*	*15,493*	*15,493*
Non-Investments	*11,173*	*11,173*	*11,173*	*11,173*	*10,974*	*10,974*
adj. R^2	2.58%	45.20%	45.20%	41.80%	42.80%	42.00%

A3.1 Complete regression results (*continued*)

Panel B: Control Variables *(continued)*

Dependent variable = invested						
Sample	Pooled Sample				Retail Investors	
Investor Type (for which *type* equals 1)	-		Institutional		*pfsize* ≥ 5	*Øamount* ≥ € 500
	(1)	(2)	(3)	(4)	(5)	(6)
rewards		0.039	0.039	0.034	0.021	0.026
		(1.113)	(1.094)	(0.960)	(0.569)	(0.775)
*type * rewards*			0.063	0.031	0.049	0.017
			(1.394)	(0.630)	(1.473)	(0.825)
%eq_offered		0.022***	0.022***	0.023***	0.026***	0.022***
		(10.490)	(10.357)	(9.894)	(11.015)	(10.044)
*type * %eq_offered*			0.001	0.001	-0.010***	0.005***
			(0.257)	(0.288)	(-4.767)	(5.455)
opp		-0.256***	-0.256***	-0.238***	-0.234***	-0.245***
		(-13.675)	(-13.686)	(-11.479)	(-11.242)	(-11.776)
*type * opp*			-0.000	0.040*	-0.027	0.041***
			(-0.000)	(1.797)	(-1.575)	(2.908)
%funded		-0.003***	-0.003***	-0.004***	-0.004***	-0.004***
		(-7.689)	(-7.665)	(-8.921)	(-8.180)	(-9.102)
*type * %funded*			-0.000	-0.001	-0.000	0.000
			(-0.561)	(-1.447)	(-0.615)	(0.738)
#staff		0.003	0.003	0.001	0.002	0.001
		(0.503)	(0.522)	(0.270)	(0.401)	(0.181)
*type * #staff*			-0.002	-0.002	-0.002	0.001
			(-0.403)	(-0.293)	(-0.426)	(0.288)
pfsize		0.001	0.001	-0.005	-0.023***	-0.005
		(0.855)	(0.872)	(-1.143)	(-2.824)	(-1.178)
*type * pfsize*			-0.002	0.007	0.019**	0.000
			(-0.490)	(0.940)	(2.507)	(0.051)
type		0.011	0.027		1.962***	
		(0.749)	(0.029)		(2.831)	
constant	0.699**	-1.526**	-1.537**	-1.948***	-2.566***	-1.974***
	(2.623)	(-2.209)	(-2.200)	(-3.124)	(-3.704)	(-3.116)
Country FE		Yes	Yes			
Year FE		Yes	Yes	Yes	Yes	Yes
Investor FE				Yes	Yes	Yes
Obs.	26,968	26,968	26,968	26,968	26,467	26,467
Investments	*15,795*	*15,795*	*15,795*	*15,795*	*15,493*	*15,493*
Non-Investments	*11,173*	*11,173*	*11,173*	*11,173*	*10,974*	*10,974*
adj. R^2	2.58%	45.20%	45.20%	41.80%	42.80%	42.00%

Notes: This table reports (the full) OLS regression results of different specifications of model (1) that differ with respect to the employed explanatory variables and fixed effects structures. The pooled sample [specifications (1) to (4)] comprises 26,968 transactions, whereas the sample of only retail investors [specification (5) and (6)] comprises 26,467 transactions. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

A3.2 Varying thresholds of investor attributes

Dependent variable = invested						
Sample	Retail Investors					
Investor Type (for which *type* equals 1)	*pfsize* ≥ 3	*pfsize* ≥ 10	*pfsize* ≥ 15	*Øamount* ≥ € 250	*Øamount* ≥ € 1,000	*Øamount* ≥ € 5,000
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.018	-0.033*	-0.035*	-0.042**	-0.037*	-0.039**
	(-0.882)	(-1.879)	(-1.914)	(-2.378)	(-1.998)	(-2.088)
*type * overall_discl*	-0.017	0.031*	0.019	0.012	-0.001	0.139**
	(-0.705)	(1.776)	(1.049)	(1.168)	(-0.055)	(2.128)
fin_discl	0.072***	0.071***	0.070***	0.063***	0.065***	0.067***
	(3.705)	(4.225)	(4.067)	(3.872)	(3.744)	(3.844)
*type * fin_discl*	-0.008	-0.030	-0.043	0.017*	0.035**	0.074**
	(-0.380)	(-1.547)	(-1.630)	(1.745)	(2.581)	(2.057)
team_discl	0.056**	0.049**	0.046**	0.045**	0.048**	0.047**
	(2.512)	(2.608)	(2.459)	(2.558)	(2.494)	(2.397)
*type * team_discl*	-0.025	-0.055**	-0.068**	0.006	-0.017	-0.110***
	(-1.371)	(-2.337)	(-2.672)	(0.584)	(-1.016)	(-2.959)
vid_length	0.087***	0.077***	0.073***	0.072***	0.072***	0.071***
	(4.083)	(4.157)	(3.879)	(4.108)	(3.706)	(3.638)
*type * vid_length*	-0.043***	-0.074***	-0.072***	-0.002	-0.015	-0.040
	(-2.861)	(-3.855)	(-3.491)	(-0.175)	(-1.119)	(-1.610)
hist_fin_stat	-0.067	-0.065*	-0.065*	-0.046	-0.058	-0.062
	(-1.576)	(-1.799)	(-1.803)	(-1.351)	(-1.597)	(-1.645)
*type * hist_fin_stat*	-0.031	-0.005	0.005	-0.065***	-0.090*	-0.313***
	(-0.673)	(-0.127)	(0.071)	(-2.807)	(-1.836)	(-2.919)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	26,467	26,467	26,467	26,467	26,467	26,467
Investments	*15,493*	*15,493*	*15,493*	*15,493*	*15,493*	*15,493*
Non-Investments	*10,974*	*10,974*	*10,974*	*10,974*	*10,974*	*10,974*
adj. R^2	42.70%	42.70%	42.40%	42.00%	41.90%	41.80%

Notes: This table reports OLS regression results of different specifications of model (1) that differ with respect to the definition of the binary coded variable (*type*) that is used to test for differences between investors that differ with regard to their number of investments in distinct start-ups (*pfsize*) at investment date [specifications (1) to (3)] as well as differences with regard to the amount that an investor has invested, on average, per start-up (*Øamount*) since she registered on *Companisto* [specifications (4) to (6)]. The sample only contains transactions by retail investors. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

A4 Sub-sample regressions

A4.1 Sub-sample of transactions related to firms with no publicly available historical financial statements

Dependent variable = invested						
Sample	Pooled Sample				Retail Investors	
Investor Type (for which *type* equals 1)	-		Institutional		*pfsize* ≥ 5	*Øamount* ≥ € 500
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.100**	-0.039	-0.039	-0.034	-0.032	-0.038
	(-2.784)	(-1.522)	(-1.515)	(-1.203)	(-0.957)	(-1.370)
*type * overall_discl*			-0.094**	-0.039	-0.013	0.030
			(-2.375)	(-0.579)	(-0.343)	(1.578)
fin_discl	-0.007	0.033	0.031	0.047*	0.041	0.042
	(-0.239)	(1.243)	(1.197)	(1.749)	(1.390)	(1.567)
*type * fin_discl*			0.047*	0.089**	0.022	0.047***
			(1.814)	(2.246)	(0.565)	(3.671)
team_discl	-0.014	0.023	0.023	0.035	0.035	0.036
	(-0.385)	(0.732)	(0.723)	(1.037)	(0.970)	(1.100)
*type * team_discl*			0.070	0.065	0.033	-0.009
			(1.680)	(1.044)	(0.681)	(-0.522)
vid_length	0.033	0.063**	0.064**	0.068**	0.084**	0.072**
	(0.621)	(2.247)	(2.280)	(2.234)	(2.573)	(2.457)
*type * vid_length*			-0.005	-0.044	-0.049	-0.032**
			(-0.153)	(-1.053)	(-1.351)	(-2.200)
Controls		Yes	Yes	Yes	Yes	Yes
Country FE		Yes	Yes			
Year FE		Yes	Yes	Yes	Yes	Yes
Investor FE				Yes	Yes	Yes
Obs.	19,525	19,525	19,525	19,525	19,181	19,181
Investments	*11,739*	*11,739*	*11,739*	*11,739*	*11,519*	*11,519*
Non-Investments	*7,786*	*7,786*	*7,786*	*7,786*	*7,662*	*7,662*
adj. R^2	4.41%	42.80%	42.80%	40.20%	41.00%	40.40%

Notes: This table reports OLS regression results of different specifications of model (1) that differ with respect to the employed explanatory variables and fixed effects structures. In contrast to the evidence presented in Table 8, the underlying sample only contains transactions related to firms for which no financial statement information was publicly available through the online-platform of the Federal Gazette (Bundesanzeiger) at the investment date (*t*). The pooled sample [specifications (1) to (4)] therefore comprises 19,525 transactions, whereas the sample of only retail investors [specification (5) and (6)] comprises 19,181 transactions. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

A4.2 Sub-sample of investor types and by investor attributes

Dependent variable = invested						
Sample	Full Sample			Only frms with no historical financial statements		
Sub-sample	Institutional Investor	Retail Inv., *pfsize* ≥ 5	Retail Inv., *Øamount* ≥ € 500	Institutional Investor	Retail Inv., *pfsize* ≥ 5	Retail Inv., *Øamount* ≥ € 500
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.029	-0.025	-0.037	-0.074	-0.040	-0.008
	(-0.845)	(-1.318)	(-1.595)	(-1.115)	(-1.417)	(-0.234)
fin_discl	0.120***	0.058***	0.101***	0.136***	0.075**	0.092***
	(5.862)	(3.434)	(4.189)	(4.461)	(2.678)	(2.920)
team_discl	0.084***	0.022	0.039	0.100*	0.069*	0.029
	(5.657)	(1.434)	(1.320)	(1.782)	(1.904)	(0.727)
vid_length	0.017	0.030**	0.055*	0.023	0.038	0.037
	(0.981)	(2.074)	(1.958)	(0.510)	(1.320)	(0.996)
hist_fin_stat	-0.177***	-0.094**	-0.131**	-0.074	-0.040	-0.008
	(-3.846)	(-2.341)	(-2.110)	(-1.115)	(-1.417)	(-0.234)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	501	6,932	4,888	344	5,125	3,592
Investments	*302*	*4,900*	*2,465*	*220*	*3,612*	*1,877*
Non-Investments	*199*	*2,032*	*2,423*	*124*	*1,513*	*1,715*
adj. R^2	45.10%	47.80%	39.90%	38.70%	48.20%	39.80%

Notes: This table reports OLS sub-sample regression results of model (1). In Columns (1) to (3) regression results for the full sample are presented. In Columns (4) to (6) regression results for the sample of firms for which no financial statement information was publicly available through the online-platform of the Federal Gazette (Bundesanzeiger) at the investment date (*t*). In Columns (1) and (4) only transactions by institutional investors are included. Columns (2) and (5) only include transactions by retail investors with equal to or more than five distinct start-ups in their portfolio. In Columns (3) and (6) includes only investors that have, on average, invested equal to or more than 500 Euro per investment since they registered on *Companisto*. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

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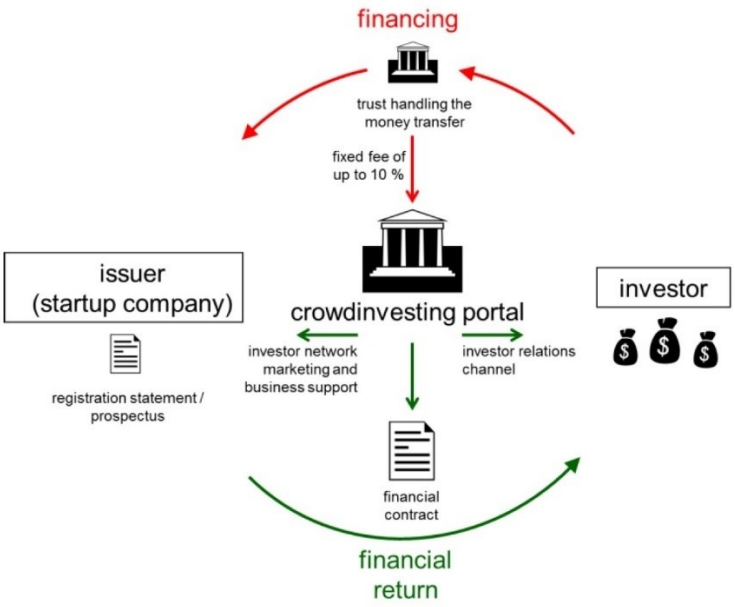
FIGURE 1

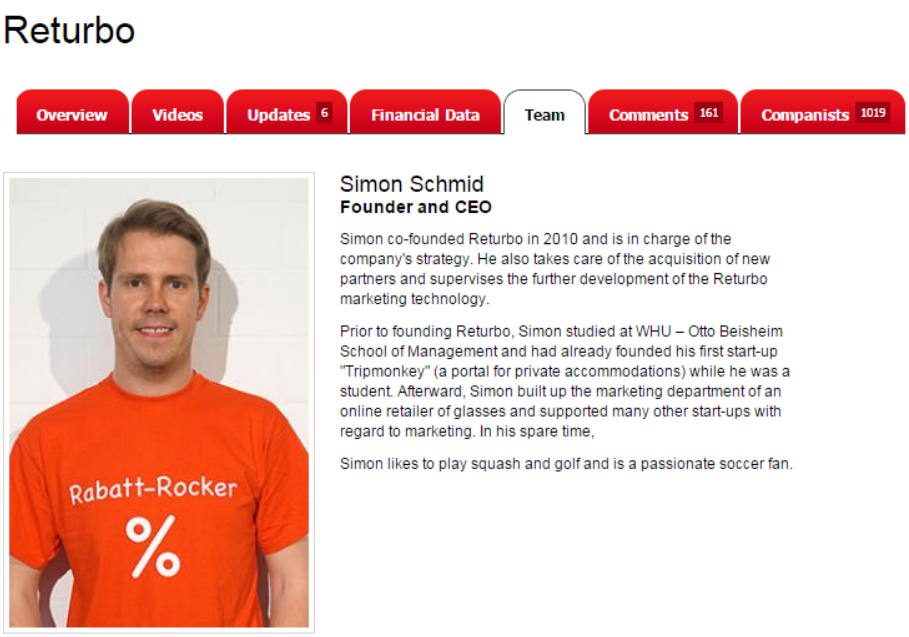
Crowdinvesting – market structure



Source: Hornuf and Schwienbacher 2016a.

FIGURE 2

Companisto interface – "Team"-Section



Notes: This figure shows a screenshot taken on *Companisto's* webpage. It gives an example of the information provided in the "Team"-Section of each listing.

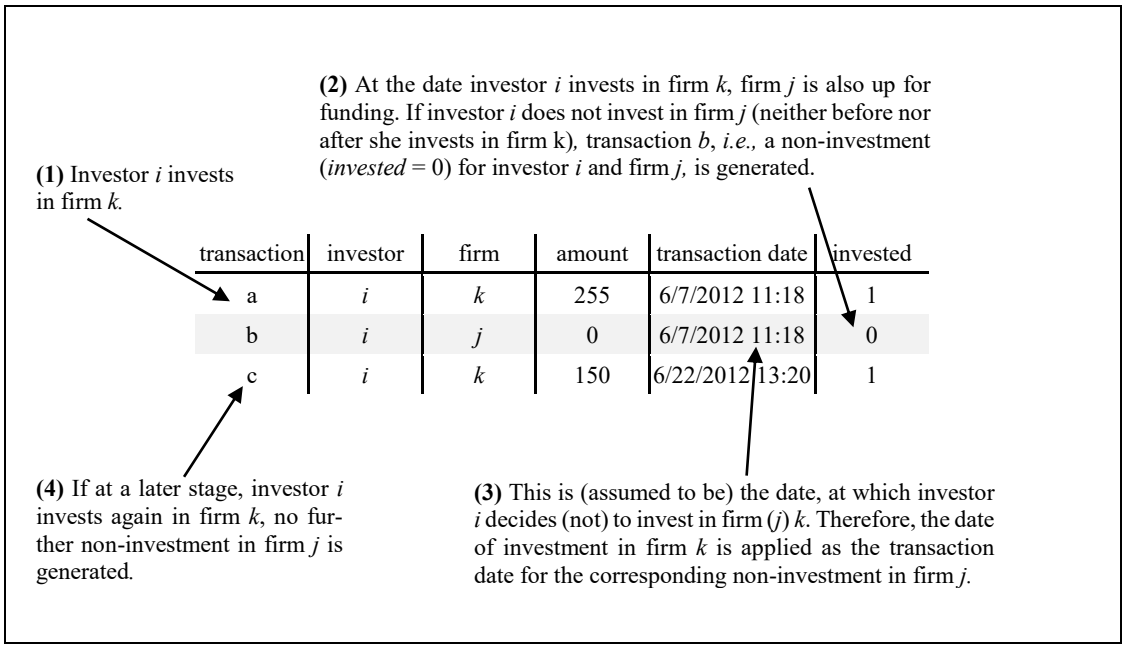
FIGURE 3

Companisto interface – "Financial Data"-Section

Notes: This figure shows a screenshot taken on *Companisto's* webpage. It illustrates firms' information environment on *Companisto*. The screenshot gives an example of the "Financial Data-Section" of each listing. In the different tabs (*i.e.*, sections) of each listing (*e.g.*, "Overview", "Team", etc.) potential investors are provided with different types of information (*e.g.*, information on the business model, investments by others, etc.).

FIGURE 4

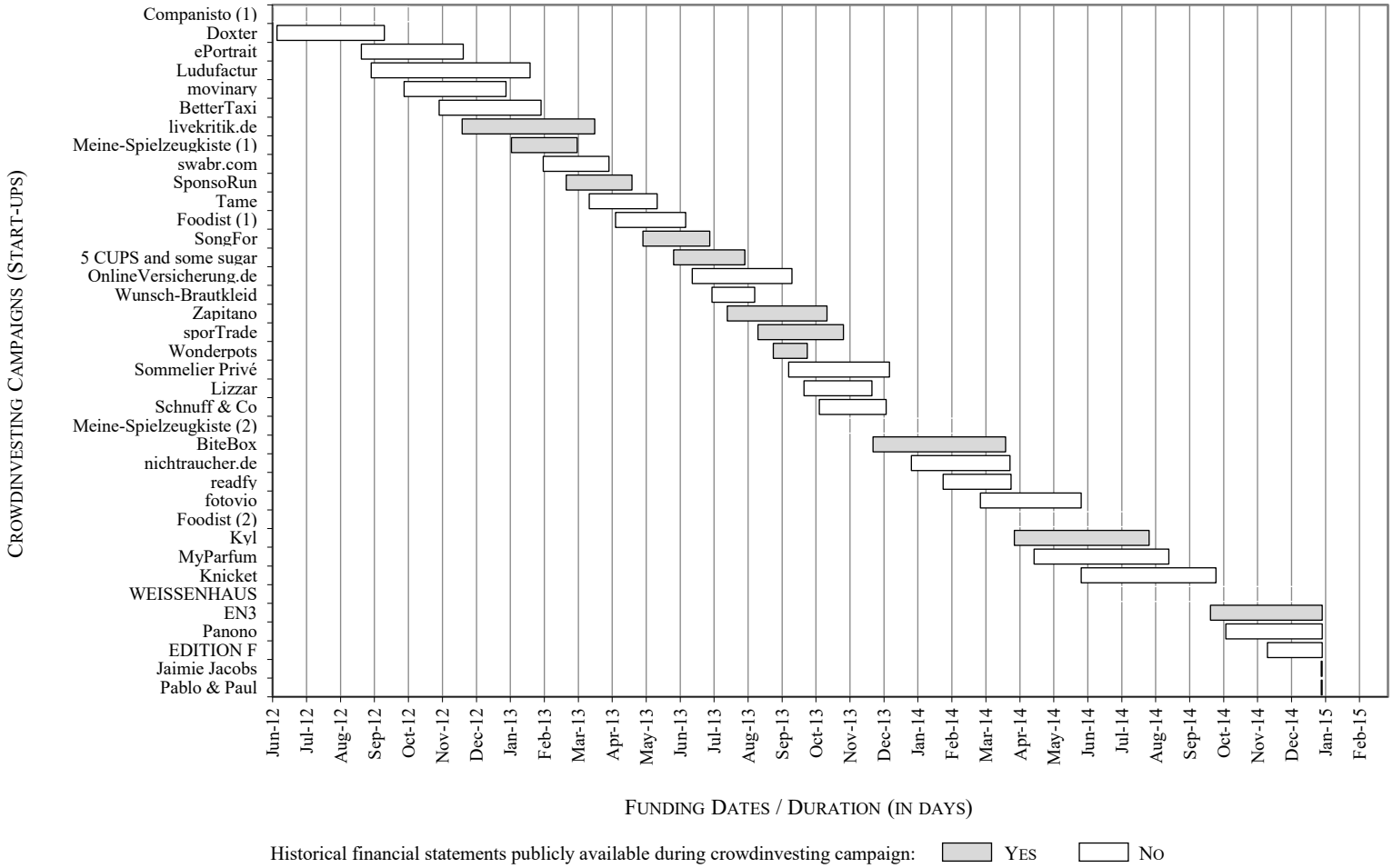
Generation of non-investments



Notes: This figure illustrates the approach taken in the scope of the empirical analysis in order to generate non-investments, *i.e.*, transactions for which the value of the variable *invested* is set to zero. Steps (1) to (4) describe the basic intuition behind this process.

FIGURE 5

Funding history on Companisto



Notes: This figure gives an overview of the funding start and duration of all funding rounds conducted on *Companisto* as of January 2015.

TABLE 1

Sample selection

Data on 10,027 investors, 37 listings (35 firms), 28,768 investments (as of January 2015)

	investors	*listings*	*transactions*
Number of investments (transactions with invested = 1)	10,027	37	28,768
less number of investments by investors from countries other than Austria, Germany or Switzerland	-337		-828
plus non-investment (transactions with invested = 0)			26,081
	9,690	**37**	**54,021**
less investments that are related to listings that...			
…represent second funding rounds of firms on the CIPs		-2	-5,482
…are related to other investment types		-2	-4,021
less transactions with incomplete information	-53		-3,011
less transactions of investors with less than two holdings	-5,737		-14,539
Final sample	**3,900**	**33**	**26,968**

Notes: This table illustrates the specific steps taken in the selection of the final sample.

TABLE 2

Measuring voluntary disclosure

Panel A: Financial Disclosure Index (*fin_discl*) components

Item	Level of detail	Variable	Definition
Application of raised capital		*applic_funding*	1 if application of the raised capital is given, 0 otherwise
Key performance indicators		*kpi*	1 if information on key performance indicators is provided, 0 otherwise
Revenue	Breakdown by source	*rev_sources*	1 if sources are provided, 0 otherwise
	Sensitivity analysis	*rev_sensitivity*	1 if sensitivity analysis is provided, 0 otherwise
Costs	Breakdown by source	*exp_breakdown*	1 if breakdown is provided, 0 otherwise
Cashflow information		*cf_info*	1 if cashflow information is provided, 0 otherwise
	Breakdown by activity	*cf_activities*	1 if breakdown by activity is provided, 0 otherwise

Panel B: Team Disclosure Index (*team_discl*) components

Item	Level of detail	Variable	Definition
Interests		*interests*	1 if interests are given, 0 otherwise
Education	Place of studies	*educ_place*	1 if place of studies is given, 0 otherwise
	Field of study	*educ_field*	1 if field of studies is given, 0 otherwise
	Degree	*educ_degree*	1 if degree of education is given, 0 otherwise
Work experience	Industry	*exp_industry*	1 if industry is given, 0 otherwise
	Duration	*exp_duration*	1 if duration is given, 0 otherwise
	Employer	*exp_employer*	1 if employer is given, 0 otherwise

Notes: This table illustrates the composition of the two disclosure indices. Specifically, the description and variable definition of each component of the financial disclosure index (Panel A) and the team disclosure index (Panel B) are presented.

TABLE 3

Summary statistics of disclosure indices

Panel A: Financial Disclosure Index (*fin_discl*) components

Variable	Obs.	Mean
applic_funding	33	0.727
kpi	33	0.636
rev_sources	33	0.636
rev_sensitivity	33	0.030
exp_breakdown	33	0.879
cf_info	33	0.485
cf_activities	33	0.333
fin_discl	**33**	**3.727**

Panel B: Team Disclosure Index (*team_discl*) components

Variable	Obs.	Mean
interests	33	0.506
educ_place	33	0.689
educ_field	33	0.767
educ_degree	33	0.308
exp_industry	33	0.965
exp_duration	33	0.367
exp_employer	33	0.663
team_discl	**33**	**4.264**

Notes: This table presents the descriptive statistics for the self-constructed disclosure indices. Specifically, the descriptive statistics for each item of the financial disclosure index (Panel A) and the team disclosure index (Panel B) are presented. See Appendix A1 for the definitions of the two disclosure indices. Definitions for the specific items of the financial disclosure index (Panel A) and the team disclosure index (Panel B) are given in Table 2. In addition, Appendix A2 contains correlations for the components of both indices.

TABLE 4

Investor attributes

Panel A: Investors and Transactions

Investor type	Investors		Transactions					
			Investments		Non-Investments		Total	
Institutional	74	*1.90%*	302	*1.91%*	199	*1.78%*	501	*1.86%*
Retail	3,826	*98.10%*	15,493	*98.09%*	10,974	*98.22%*	26,467	*98.14%*
Total	3,900	*100.00%*	15,795	*100.00%*	11,173	*100.00%*	26,968	*100.00%*

Panel B: Investor Attributes by Age

			Investor properties				(Share of) Investor groups		
Age	Investors	Transactions	*male (= 1)*	*Øamount (in €)*	*pfsize (# of start-ups)*	*exp (in weeks)*	*Øamount* ≥ € 500	*pfsize* ≥ 5	*exp* ≥ 1 year
≤ 19	34	146	0.97	89.78	3.74	39.41	5.88%	52.94%	26.47%
20 to 29	1,246	8,206	0.91	242.76	4.53	71.27	12.12%	58.03%	64.04%
30 to 39	1,336	9,737	0.89	417.24	5.00	78.53	19.69%	62.35%	71.63%
40 to 49	781	5,497	0.88	608.12	4.70	73.12	26.12%	62.10%	64.02%
50 to 59	335	2,177	0.80	785.86	4.36	73.61	27.46%	53.73%	60.90%
60 ≥	94	704	0.86	801.29	4.99	75.43	36.17%	65.96%	61.70%
Retail	3,826	26,467	0.89	438.18	4.72	74.21	19.50%	60.14%	66.02%
Institutional	74	501	-	1,274.25	4.84	67.05	43.24%	62.16%	72.97%
Full sample	3,900	26,968	-	454.05	4.72	74.07	19.95%	60.18%	66.15%

Notes: This table provides descriptive statistics for the attributes of the investors registered on *Companisto* as of January 2015. Panel A provides information on the investor types (*i.e.*, the share of retail and institutional investors). The data is presented on the transaction-level and illustrates the number of investments (non-investments) for each group of investors. Panel B presents investor attributes by age group and investor type. See Appendix A1 for the variable definitions.

TABLE 5

Summary statistics and correlations – investor level

Panel A: Summary Statistics – Investor Level

Variable	Obs.	Mean	SD	Min	P25	P50	P75	Max
age	3,826	36.30	10.41	18.18	28.17	34.22	43.16	85.30
male	3,826	0.89	0.32	0.00	1.00	1.00	1.00	1.00
pfsize	3,900	4.72	4.68	2.00	2.00	3.00	5.00	35.00
exp	3,900	74.07	37.79	0.14	42.43	72.57	109.36	137.00
amount	3,900	454.05	1,409.24	5.00	40.00	125.00	364.58	35,200.00

Panel B: Correlations – Investor Level

N = 3,900	(1)	(2)	(3)	(4)	(5)
(1) *age*		**-0.079**	0.019	**0.055**	**0.263**
(2) *male*	**-0.086**		**0.121**	0.011	**0.059**
(3) *pfsize*	0.012	**0.085**		**0.258**	-0.020
(4) *exp*	**0.044**	0.011	**0.294**		**-0.142**
(5) *Øamount*	**0.141**	**0.029**	**-0.061**	**-0.128**	

Notes: This table provides descriptive statistics for the attributes of the investors registered on *Companisto* as of January 2015. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. Pearson's correlation coefficients are shown in the lower triangle while Spearman's rank correlations appear above the diagonal. See Appendix A1 for the variable definitions.

TABLE 6

Summary statistics and correlations – firm level

Panel A: Summary Statistics – Firm Level

Variable	Obs.	Mean	SD	Min	P25	P50	P75	Max
overall_discl	33	5.23	1.26	2.84	4.13	5.43	6.20	7.33
fin_discl	33	3.70	1.79	0.00	2.00	4.00	5.00	6.00
team_discl	33	4.26	0.80	2.33	4.00	4.33	5.00	5.67
vid_length	33	5.01	1.10	2.92	4.07	5.20	5.97	7.03
hist_fin_stat	33	0.24	0.44	0.00	0.00	0.00	0.00	1.00
%eq_offered	33	14.07	7.12	4.69	9.09	12.50	16.67	33.33
%held_by_third	33	14.79	20.42	0.00	0.00	5.00	24.00	70.00
value	33	1,800,000	2,130,000	650,000	900,000	1,100,000	1,750,000	12,000,000
years_i_b	33	1.21	1.08	0.00	0.00	1.00	2.00	5.00
years_2_be	33	2.02	0.62	1.00	1.50	2.00	2.00	4.00
patents	33	0.09	0.29	0.00	0.00	0.00	0.00	1.00
rewards	33	0.39	0.50	0.00	0.00	0.00	1.00	1.00
team_buslaw	33	0.76	0.44	0.00	1.00	1.00	1.00	1.00
team_industry_exp	33	0.70	0.47	0.00	0.00	1.00	1.00	1.00
team_start-up_exp	33	0.76	0.44	0.00	1.00	1.00	1.00	1.00
#staff	33	7.58	6.41	2.00	4.00	6.00	9.00	38.00

TABLE 6 *(continued)*

Summary statistics and correlations – firm level

Panel B: Correlation Matrix – Firm Level

N = 33	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) *overall_discl*		**0.491**	-0.059	**0.498**	0.193	**0.356**	0.032	**0.333**	0.022	-0.108	0.011	0.182	0.119	**-0.374**	-0.223	-0.198
(2) *fin_discl*	**0.540**		-0.174	**0.416**	0.224	0.200	0.076	**0.454**	**0.393**	**-0.390**	**0.317**	0.073	-0.087	-0.170	-0.266	0.054
(3) *team_discl*	0.014	-0.173		-0.003	-0.190	0.065	0.085	-0.204	0.031	-0.180	-0.156	0.059	0.149	0.087	0.216	0.046
(4) *vid_length*	**0.450**	**0.424**	-0.012		-0.097	0.012	0.125	0.266	0.102	-0.230	0.006	0.150	0.145	**-0.357**	-0.267	-0.106
(5) *hist_fin_stat*	0.203	0.241	-0.180	-0.094		-0.153	0.217	0.228	**0.433**	0.098	0.313	**0.123**	-0.175	-0.243	-0.010	0.056
(6) *%eq_offered*	0.268	0.131	-0.085	-0.028	-0.153		-0.082	-0.171	-0.307	-0.179	**-0.344**	**-0.082**	0.216	0.014	-0.182	-0.376
(7) *%held_by_third*	0.069	0.048	0.056	0.168	0.270	-0.101		0.011	**0.415**	0.068	-0.071	**0.308**	-0.241	-0.055	-0.039	0.257
(8) *value*	0.165	**0.347**	-0.168	0.161	0.079	-0.158	-0.023		**0.433**	0.014	**0.490**	0.206	**-0.347**	0.146	-0.276	**0.506**
(9) *years_i_b*	-0.054	**0.328**	-0.118	0.107	**0.484**	**-0.296**	**0.332**	**0.441**		-0.058	**0.407**	0.291	-0.055	0.095	-0.168	0.271
(10) *years_2_be*	-0.207	**-0.460**	-0.259	-0.249	0.037	-0.033	0.030	0.032	-0.019		0.200	0.018	-0.057	0.042	0.179	0.016
(11) *patents*	0.016	0.280	-0.239	-0.017	**0.313**	-0.282	-0.061	**0.787**	**0.530**	0.161		-0.039	**-0.313**	0.209	0.179	**0.468**
(12) *rewards*	0.155	0.087	0.045	0.178	0.123	-0.050	0.289	0.222	0.189	-0.030	-0.039		-0.123	-0.143	-0.268	0.053
(13) *team_buslaw*	0.090	-0.085	0.279	0.103	-0.175	-0.018	-0.240	-0.189	-0.153	-0.037	**-0.313**	-0.123		-0.065	0.010	**-0.505**
(14) *team_industry_exp*	**-0.328**	-0.208	0.045	**-0.340**	-0.243	0.044	-0.128	0.193	0.131	0.106	0.209	-0.143	-0.065		0.243	0.248
(15) *team_start-up_exp*	-0.211	-0.280	0.204	-0.289	-0.010	-0.167	-0.096	-0.020	-0.086	0.195	0.179	-0.268	0.010	0.243		0.004
(16) *#staff*	-0.012	0.099	0.005	0.214	0.004	-0.223	**0.292**	**0.470**	**0.302**	-0.145	**0.322**	0.162	**-0.498**	0.227	-0.184	

Notes: This table presents the descriptive statistics for the start-up attributes. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. Pearson's correlation coefficients are shown in the lower triangle while Spearman's rank correlations appear above the diagonal. See Appendix A1 for the variable definitions.

TABLE 7

Summary statistics and correlations – transaction level

Panel A: (Portfolio-weighted) Firm Properties by Investor Type – Transaction Level (Investments only)

Investor Type	Institutional			Retail		
Variable	Investments	Mean	SD	Investments	Mean	SD
overall_discl	302	**5.79**	0.51	15,493	5.46	0.69
fin_discl	302	**4.51**	0.73	15,493	4.00	1.13
team_discl	302	**4.17**	0.43	15,493	4.13	0.49
vid_length	302	**5.21**	0.45	15,493	5.12	0.51
hist_fin_stat	302	0.27	0.21	15,493	0.26	0.22
%funded	302	36.81	17.16	15,493	37.82	17.29
%eq_offered	302	**17.23**	4.00	15,493	16.87	4.96
%held_by_third	302	14.36	8.84	15,493	14.38	9.32
value	302	**2,620,000**	1,820,000	15,493	2,450,000	1,880,000
years_i_b	302	**1.34**	0.69	15,493	1.32	0.66
years_2_be	302	**1.95**	0.31	15,493	2.06	0.34
patent	302	**0.16**	0.23	15,493	0.14	0.22
rewards	302	0.44	0.27	15,493	0.46	0.26
team_buslaw	302	**0.66**	0.23	15,493	0.68	0.24
team_industry_exp	302	0.70	0.24	15,493	0.72	0.23
team_start-up_exp	302	**0.69**	0.27	15,493	0.64	0.27
#staff	302	9.13	4.46	15,493	8.75	3.80

TABLE 7 *(continued)*

Summary statistics and correlations – transaction level

Panel B: Correlation matrix – Transaction Level

N = 26,968	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) *invested*												
(2) *pfsize*	**0.180**											
(3) *exp*	**-0.076**	**0.648**										
(4) *amount*	**0.208**	**-0.025**	**-0.044**									
(5) *overall_discl*	**-0.115**	**0.085**	**0.114**	**0.015**								
(6) *fin_di*	-0.055	**0.158**	**0.222**	**0.040**	**0.514**							
(7) *team_di*	-0.013	**-0.054**	**-0.109**	**-0.012**	**0.251**	**0.004**						
(8) *vid_length*	**0.030**	**0.118**	**0.135**	**0.049**	**0.523**	**0.461**	**0.059**					
(9) *hist_fin_stat*	**-0.051**	**-0.047**	**-0.042**	-0.019	**-0.026**	**0.191**	**-0.144**	**-0.207**				
(10) *opp*	**-0.544**	**-0.257**	**0.095**	**-0.065**	**0.124**	0.044	**0.044**	0.011	**0.059**			
(11) *%funded*	**-0.313**	**-0.243**	**-0.045**	**-0.044**	**0.088**	**0.075**	**0.050**	**0.091**	**0.030**	**0.293**		
(12) *%eq_offered*	**0.153**	**0.020**	**0.033**	**0.045**	**0.028**	**-0.074**	**-0.169**	**-0.073**	**-0.293**	**0.011**	0.007	
(13) *%held_by_third*	**0.019**	0.013	-0.003	0.011	**-0.025**	**-0.025**	**0.086**	**0.051**	**0.231**	**0.091**	**0.076**	**-0.135**
(14) *value*	**0.080**	**0.112**	**0.224**	**0.098**	**0.071**	**0.356**	**-0.159**	**0.133**	**0.062**	**-0.023**	**-0.082**	**-0.228**
(15) *years_i_b*	**0.025**	**0.056**	**0.121**	**0.035**	**-0.069**	**0.341**	**-0.170**	**0.089**	**0.536**	**-0.019**	**-0.029**	**-0.417**
(16) *years_2_be*	**0.045**	**-0.015**	**0.020**	**-0.007**	**-0.311**	**-0.524**	**-0.413**	**-0.292**	**0.089**	**-0.035**	**-0.058**	**0.032**
(17) *patents*	-0.003	**0.068**	**0.159**	**0.045**	**-0.117**	**0.295**	**-0.240**	**-0.038**	**0.345**	**0.026**	**-0.097**	**-0.385**
(18) *rewards*	**0.067**	**0.048**	**0.066**	**0.053**	**0.265**	**-0.072**	**0.029**	**0.032**	**0.021**	**0.081**	**0.044**	**0.129**
(19) *team_buslaw*	**-0.051**	**-0.056**	**-0.104**	**-0.024**	**0.349**	**0.035**	**0.440**	**0.205**	**-0.200**	**-0.079**	**-0.025**	**-0.089**
(20) *team_industry_exp*	**0.105**	**0.023**	**0.059**	**0.038**	**-0.272**	**-0.268**	**-0.062**	**-0.375**	**-0.111**	**-0.052**	**-0.157**	**0.114**
(21) *team_start-up_exp*	**-0.017**	**-0.014**	**-0.041**	**-0.021**	**-0.116**	**-0.256**	**0.196**	**-0.149**	**0.065**	**0.025**	**-0.093**	**-0.255**
(22) *#staff*	**0.130**	**0.046**	**0.069**	**0.089**	**-0.079**	**0.177**	**-0.020**	**0.154**	**0.094**	**0.063**	-0.002	**-0.291**

TABLE 7 *(continued)*

Summary statistics and correlations – transaction level

Panel B: Correlation matrix – Transaction Level *(continued)*

N = 26,968	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(13) *%held_by_third*									
(14) *value*	**-0.049**								
(15) *years_i_b*	**0.330**	**0.481**							
(16) *years_2_be*	**0.114**	**0.090**	**0.089**						
(17) *patents*	**-0.038**	**0.787**	**0.612**	**0.206**					
(18) *rewards*	**0.168**	**0.246**	-0.006	**0.100**	**-0.070**				
(19) *team_buslaw*	**-0.266**	**-0.143**	**-0.193**	**-0.217**	**-0.323**	**-0.096**			
(20) *team_industry_exp*	**-0.085**	**0.255**	**0.101**	**0.192**	**0.273**	**-0.026**	**-0.217**		
(21) *team_start-up_exp*	**0.133**	**0.068**	**0.029**	**0.166**	**0.276**	**-0.304**	**-0.044**	**0.205**	
(22) *#staff*	**0.337**	**0.491**	**0.420**	**-0.103**	**0.416**	**0.154**	**-0.463**	**0.239**	**-0.063**

Notes: This table presents the descriptive statistics for the different transaction attributes. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel A, portfolio-weighted [*i.e.*, by using the relative investment amount as a weight for each investor-firm pair (*i.e.*, investment)] transaction attributes are presented by investor type. In Panel A, a statistically significant mean difference for the two sub-samples at the 0.1 level using two-tailed tests is indicated in bold type. In Panel B, statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. See Appendix A1 for the variable definitions.

TABLE 8

Full sample regressions

Dependent variable = invested						
Sample	Pooled Sample				Retail Investors	
Investor Type (for which *type* equals 1)	-		Institutional		*pfsize* ≥ 5	*Øamount* ≥ € 500
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.079**	-0.044**	-0.044**	-0.038**	-0.027	-0.037*
	(-2.482)	(-2.195)	(-2.197)	(-2.050)	(-1.389)	(-2.036)
*type * overall_discl*			0.019	0.009	0.003	0.001
			(0.640)	(0.238)	(0.114)	(0.054)
fin_discl	-0.005	0.062***	0.061***	0.068***	0.073***	0.062***
	(-0.177)	(3.440)	(3.372)	(3.848)	(4.096)	(3.724)
*type * fin_discl*			0.043**	0.053**	-0.015	0.037***
			(2.445)	(2.663)	(-0.769)	(3.172)
team_discl	0.012	0.050**	0.049**	0.046**	0.054**	0.047**
	(0.292)	(2.312)	(2.275)	(2.370)	(2.649)	(2.618)
*type * team_discl*			0.032	0.038*	-0.030	-0.009
			(1.395)	(1.939)	(-1.594)	(-0.638)
vid_length	0.061	0.069***	0.069***	0.070***	0.083***	0.073***
	(1.499)	(3.436)	(3.453)	(3.591)	(4.186)	(4.043)
*type * vid_length*			-0.042*	-0.053**	-0.053***	-0.016
			(-1.949)	(-2.346)	(-3.534)	(-1.352)
hist_fin_stat	-0.026	-0.048	-0.047	-0.064*	-0.066*	-0.053
	(-0.289)	(-1.151)	(-1.115)	(-1.702)	(-1.707)	(-1.530)
*type * hist_fin_stat*			-0.105**	-0.112**	-0.033	-0.078**
			(-2.506)	(-2.444)	(-0.717)	(-2.349)
Controls		Yes	Yes	Yes	Yes	Yes
Country FE		Yes	Yes			
Year FE		Yes	Yes	Yes	Yes	Yes
Investor FE				Yes	Yes	Yes
Obs.	26,968	26,968	26,968	26,968	26,467	26,467
Investments	*15,795*	*15,795*	*15,795*	*15,795*	*15,493*	*15,493*
Non-Investments	*11,173*	*11,173*	*11,173*	*11,173*	*10,974*	*10,974*
adj. R^2	2.58%	45.20%	45.20%	41.80%	42.80%	42.00%

Notes: This table reports OLS regression results of different specifications of model (1) that differ with respect to the employed explanatory variables and fixed effects structures. The pooled sample [specifications (1) to (4)] comprises 26,968 transactions, whereas the sample of only retail investors [specification (5) and (6)] comprises 26,467 transactions. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions. The complete regression results, *i.e.*, also including the results for the control variables, are presented in Appendix A3.1.

TABLE 9

Sub-sample analysis by retail investors' demographics and crowdinvesting experience

Dependent variable = invested						
Sample	Retail Investors					
Age group	all	< 20	20 to 29	30 to 39	40 to 49	≥ 50
Investor Type (for which *type* equals 1)	*male*	*pfsize* ≥ 5				
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.024	-0.072	-0.031	-0.024	-0.032*	0.028
	(-0.889)	(-1.220)	(-1.491)	(-0.974)	(-1.998)	(1.343)
*type * overall_discl*	-0.016	0.029	-0.006	0.005	0.022	-0.043
	(-0.875)	(0.413)	(-0.182)	(0.214)	(1.116)	(-1.578)
fin_discl	0.115***	0.103**	0.081***	0.077***	0.063***	0.038**
	(3.791)	(2.210)	(3.617)	(3.603)	(5.131)	(2.687)
*type * fin_discl*	-0.052**	-0.037	-0.037	-0.014	-0.005	0.018
	(-2.289)	(-0.802)	(-1.272)	(-0.672)	(-0.207)	(0.704)
team_discl	0.014	0.097**	0.057**	0.047*	0.066***	0.046**
	(0.560)	(2.725)	(2.694)	(1.932)	(3.444)	(2.635)
*type * team_discl*	0.036**	-0.040	-0.039	-0.040*	-0.001	-0.003
	(2.041)	(-0.932)	(-1.650)	(-2.018)	(-0.021)	(-0.114)
vid_length	0.045	0.077**	0.072***	0.076***	0.107***	0.105***
	(1.472)	(2.054)	(3.220)	(3.357)	(5.617)	(6.138)
*type * vid_length*	0.028	0.008	-0.022	-0.052***	-0.087***	-0.095***
	(1.679)	(0.164)	(-0.913)	(-3.117)	(-4.557)	(-3.022)
hist_fin_stat	-0.152**	-0.029	-0.074*	-0.073	-0.064*	-0.037
	(-2.342)	(-0.209)	(-1.729)	(-1.551)	(-1.784)	(-0.951)
*type * hist_fin_stat*	0.096*	0.103	-0.021	-0.013	-0.058	-0.119
	(1.943)	(0.735)	(-0.334)	(-0.262)	(-0.989)	(-1.614)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	26,467	347	9,166	9,145	5,267	2,542
Investments	*15,493*	*216*	*5,353*	*5,449*	*3,005*	*1,470*
Non-Investments	*10,974*	*131*	*3,813*	*3,696*	*2,262*	*1,072*
adj. R^2	41.90%	44.30%	43.00%	43.20%	42.50%	39.30%

Notes: This table reports OLS sub-sample regression results of model (1). The dependent variable is *invested*. In Columns (1) results of the sample of (all) retail investors are presented. Here, type represents an indicator variable that takes on the value 1 (0) for male (female) investors. In Columns (2) to (6) regression results for the sub-samples of different age groups of retail investors are presented. Here, *type* takes on the value (1) 0 if investors have invested in equal to or more than (less than) five distinct start-ups. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

TABLE 10

Sub-sample analysis of investment amount determinants

Dependent variable = log(amount)					
Sample	Pooled Sample				Retail Investors
Investor Type (for which *type* equals 1)	-		Institutional		*pfsize* ≥ 5
	(1)	(2)	(3)	(4)	(5)
overall_discl	-0.028	-0.048	-0.049	-0.065***	-0.029
	(-0.548)	(-1.457)	(-1.500)	(-3.099)	(-1.443)
*type * overall_discl*			0.232**	-0.147**	-0.052**
			(2.367)	(-2.484)	(-2.044)
fin_discl	0.056	0.064***	0.062***	0.054***	0.033**
	(1.269)	(2.780)	(2.841)	(4.118)	(2.575)
*type * fin_discl*			0.094	0.165***	0.035**
			(1.036)	(3.175)	(2.262)
team_discl	-0.067	0.039*	0.040*	0.023	0.013
	(-1.072)	(1.843)	(1.928)	(1.260)	(0.659)
*type * team_discl*			-0.063	-0.037	0.027
			(-0.892)	(-1.111)	(1.154)
vid_length	0.065	0.097***	0.095***	0.058***	0.056***
	(1.047)	(4.676)	(4.651)	(4.003)	(3.365)
*type * vid_length*			-0.126	-0.170**	-0.001
			(-1.002)	(-2.136)	(-0.077)
hist_fin_stat	-0.112	-0.119	-0.104	-0.010	-0.001
	(-0.919)	(-1.679)	(-1.553)	(-0.225)	(-0.020)
*type * hist_fin_stat*			-1.321***	-0.487***	-0.055
			(-4.165)	(-3.301)	(-1.279)
Controls		Yes	Yes	Yes	Yes
Country FE		Yes	Yes		
Year FE		Yes	Yes	Yes	Yes
Investor FE				Yes	Yes
Obs. (investments)	15,795	15,795	15,795	15,795	15,493
adj. R^2	0.72%	9.60%	9.68%	81.20%	81.00%

Notes: This table reports OLS regression results of different specifications of model (1) that differ with respect to the employed explanatory variables and fixed effects structures. However, in contrast to model (1), the employed dependent variable is the natural logarithm of the investment *amount*. As this analysis focuses on the identification of factors that explain variation in the investment amount, I exclude all non-investments. The pooled sample [specifications (1) to (4)] therefore comprises 15,795 investments, whereas the sample of only retail investors [specification (5)] comprises 15,493 investments. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

TABLE 11

Sub-sample analysis of retail investors' investment amount by gender and age group

Dependent variable = log(amount)						
Sample	Retail Investors					
Age group	all	< 20	20 to 29	30 to 39	40 to 49	≥ 50
Investor Type (for which *type* equals 1)	*male*			*pfsize* ≥ 5		
	(1)	(2)	(3)	(4)	(5)	(6)
overall_discl	-0.012	0.053	-0.013	-0.068**	0.004	-0.046
	(-0.311)	(0.576)	(-0.465)	(-2.085)	(0.142)	(-1.000)
*type * overall_discl*	-0.058	-0.428*	-0.126**	0.006	-0.058	0.003
	(-1.365)	(-1.904)	(-2.157)	(0.156)	(-1.373)	(0.036)
fin_discl	-0.023	-0.008	0.030	0.033	0.044**	0.044*
	(-0.811)	(-0.141)	(1.620)	(1.422)	(2.366)	(1.975)
*type * fin_discl*	0.084***	0.202	0.094**	0.011	0.023	0.000
	(2.944)	(1.185)	(2.169)	(0.532)	(0.625)	(0.008)
team_discl	0.025	-0.165*	0.036	0.002	0.000	-0.007
	(0.897)	(-2.001)	(1.363)	(0.082)	(0.023)	(-0.224)
*type * team_discl*	0.002	0.656***	-0.008	0.033	0.048	0.130**
	(0.077)	(3.036)	(-0.179)	(1.051)	(1.166)	(2.610)
vid_length	0.046**	-0.025	0.046**	0.078***	0.008	0.105***
	(2.081)	(-0.267)	(2.040)	(2.880)	(0.386)	(4.040)
*type * vid_length*	0.013	0.192	0.015	0.003	0.007	-0.134***
	(0.581)	(1.105)	(0.419)	(0.104)	(0.213)	(-3.023)
hist_fin_stat	0.050	0.059	-0.033	0.046	0.023	-0.037
	(0.595)	(0.304)	(-0.504)	(0.668)	(0.374)	(-0.646)
*type * hist_fin_stat*	-0.055	-0.636	-0.066	0.020	-0.175*	-0.137
	(-0.720)	(-1.200)	(-0.700)	(0.279)	(-1.823)	(-1.118)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	15,493	216	5,353	5,449	3,005	1,470
adj. R^2	81.00%	66.70%	76.60%	79.30%	84.30%	86.30%

Notes: This table reports OLS sub-sample regression results of model (1). The dependent variable is the natural logarithm of the investment *amount*. In Columns (1) results of the sample of (all) retail investors are presented. Here, type represents an indicator variable that takes on the value 1 (0) for male (female) investors. In Columns (2) to (6) regression results for the sub-samples of different age groups of retail investors are presented. Here, *type* takes on the value (1) 0 if investors have invested in equal to or more than (less than) five distinct start-ups. The table reports regression coefficient estimates and t-statistics (in parentheses). The t-statistics are based on robust standard errors with one-way clustering by firm. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

II

Crowdinvestors' Information Acquisition: An Analysis of Investor-Level Google Analytics Data

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Abstract

This study examines retail investors' actual information acquisition in the Crowdinvesting market. Using proprietary investor-level Google Analytics data from *Companisto*, one of the largest German Crowdinvesting platforms, I find that crowdinvestors do not consider a substantial fraction of start-ups' (financial) disclosures before investing. Furthermore, I show that investors' information acquisition varies with their demographics, their level of crowdinvesting experience and (average) investment amounts. My findings are consistent with investors acquiring less information in the presence of potential signals of quality. Specifically, it appears that investors decrease information acquisition following the public disclosure of professional investments during the crowdinvesting campaign and for firms that hold patents. Also, I find a negative association between investors' information acquisition and the progress (*i.e.*, the stage) of the funding round with this association being more pronounced for more experienced crowdinvestors. Finally, my results suggest that investors acquire less information for less risky investments.

Keywords: retail investors, information acquisition, crowdinvesting

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1 Introduction

In crowdinvesting, (unsophisticated) retail investors take on the role of risk capital providers, a field traditionally reserved for professional investors (*e.g.*, venture capital firms and business angels) (Mollick 2013)[59,60]. The internet-based and, therefore, easily accessible nature of so-called crowdinvesting portals (CIPs) and the services they provide in their function as financial intermediaries put (retail) investors in a position in which they are just a few clicks away from an investment in an early-stage start-up. However, the success of this relatively new form of external entrepreneurial financing is affected by the relative costs of raising capital and thus the level of regulation. In many jurisdictions, disclosure requirements in the context of crowdinvesting campaigns are relatively low. In Germany, they comprise unaudited financial statements along with a brief description of risks associated with the investment. CIPs further require firms to provide additional disclosures related to the business model, the expected future performance and the managing team. Thus, most available information is unaudited and partly (*ex ante*) unverifiable. Combined with the lack of operating history and the low relevance of historical financial statements for the assessment of the economic potential of early-stage ventures, it is unclear which information investors (should) use as a basis for their investment decisions (Bradford 2012; Mäschle 2012; Cumming and Johan 2013).[61]

[59] As all three studies constituting this Ph.D. thesis investigate investor behavior in crowdinvesting (on *Companisto*), there are certain, and in some cases inevitable, similarities in the structure and contents of these studies. Specifically, as the order of the papers presented in this study reflects the chronology of their first drafts, my second (and third) study build(s) up on my first (and second) study. These similarities are particularly pronounced in the discussion of the related literature [pages 89 to 90 (151 to 152) of the second (third) paper build up on pages 12 to 13 and pages 23 to 29 of the first (and pages 89 to 90 of the second) paper], the description of the institutional environment [pages 91 to 97 (153 to 154) of the second (third) paper build up on pages 17 to 23 of the first (and pages 91 to 97 of the second) paper], and the (discussion of the) variables used in the empirical analysis [pages 98 to 103 of the second paper build up on pages 31 to 38 of the first paper]. As all three studies have not been previously published, for the scope of this dissertation, I generally abstain from self-quotations. However, in places, I discuss the results of my prior studies or name them as examples for prior findings.

[60] Note that the discussion in the entire following paragraph is based on Bradford (2012), Mäschle (2012), and Cumming and Johan (2013).

[61] See Klöhn *et al.* (2016) for a more detailed discussion of start-ups' disclosure requirements in Germany.

I add to this question by providing descriptive empirical evidence on retail investors' actual information acquisition on *Companisto*, one of the largest German crowdinvesting platforms. Consistent with prior evidence from traditional capital markets (*e.g.*, Bhattacharya *et al.* 2012), I find that crowdinvestors tend to neglect (*i.e.*, don't access) a substantial fraction of start-ups' (financial) disclosures. Specifically, I find that the (projected) financial disclosures that start-ups provide in addition to historical financial statements are accessed prior to only around 50 percent of all investments. Given that this information is *ex ante* unverifiable in nature and unaudited, it is not clear whether investors should consider this information for their investment decisions (Stocken 2000; Mercer 2004). Related evidence on the selection criteria of professional risk capital providers, for example, suggests that Business Angels consider the reliability of start-ups' financial projections as insufficient as to use them for valuation purposes (Mason and Rogers 1997; van Osnabrugge and Robinson 2000). Nevertheless, start-ups' financial projections on *Companisto* should still be useful for respective investors as they are accompanied by a discussion of the underlying assumptions and might (therefore) be informative with regard to the abilities (*i.e.*, financial knowledge) and personal characteristics (*e.g.*, level of confidence) of the managing team. The evidence presented by Mason and Harrison (1996), for example, suggests that unrealistic and flawed financial projections are major deal rejection factors for Business Angels. Moreover, related evidence from crowdinvesting markets (*e.g.*, Ahlers *et al.* 2015; Hemaidan 2017) indicates a positive association between start-ups' financial information and 'funding success'.

My analyses further reveal that crowdinvestors' information acquisition varies with their demographics, their level of crowdinvesting experience as well as their (average) investment amounts. Specifically, my results indicate a negative (positive) association between investors' age (average investment amount) and both their likelihood of accessing and the time spent on processing start-ups' disclosures on *Companisto*. Moreover, I find that male investors

are more likely to access the different types of information (*e.g.*, financial forecasts, profiles of the managing team) provided in each crowdinvesting. Consistent with prior literature on the decision criteria of professional risk capital providers (*e.g.*, Häussler *et al.* 2012), my findings further suggest that certain firm attributes which investors might consider as signals of start-up quality (*e.g.*, patents) are negatively associated with the time investors spend on the acquisition of forward-looking financial information. Also, my evidence indicates that the presence of professional investments during the crowdinvesting campaign [*i.e.*, relatively large investments (1,000 Euro or above) by firms whose names suggest professional risk capital providers] is negatively associated with investors' information acquisition. In line with this evidence and consistent with research on the selection criteria of Business Angels (*e.g.*, van Osnabrugge 2000; Sudek 2006), I find that the presence of co-investments by professional risk capital providers prior to the crowdinvesting campaign is associated with investors' information acquisition. Finally, I find that investors spend significantly less time on information acquisition if the start-up issues a debt (instead of an equity-like) security, suggesting that the extent of information acquisition also varies with the level of investment risk.

The evidence presented in this study adds to a series of papers on (the determinants of) retail investors' information usage that indicate that (unsophisticated) private investors primarily use filtered information (*e.g.*, Elliott *et al.* 2008; Ernst *et al.* 2009), tend to ignore relevant information (*e.g.*, Bhattacharya *et al.* 2012), and have problems to process (complex) financial information (*e.g.*, Frederickson and Miller 2004; Koonce *et al.* 2010) (see Cascino *et al.* 2013, 2014 for an overview and a more detailed discussion). Several more recent studies provide direct evidence on investors' actual information acquisition by analysing Google searches (Drake *et al.* 2012) and the download activity on EDGAR[62] (Drake *et al.* 2015, 2017; Loughran and McDonald 2017). Drake *et al.* (2015), for example, find that EDGAR activity is positively

[62] Electronic Data Gathering, Analysis, and Retrieval system.

associated with firms' performance and the strength of their information environment. More closely related to my study is the evidence presented by Drake *et al.* (2017) who investigate how information acquisition via EDGAR is associated with the demographics in certain areas (*i.e.*, U.S. ZIP codes). However, the data used in these studies does typically not allow for investor-level analyses and can (therefore) not link investors' information behavior to their investment activity. I add to this literature in several ways. First, by employing user-level Google Analytics (GA) data, I provide a more direct and complete measure of retail investors' actual information acquisition. Secondly, in contrast to studies that focus on information acquisition related to (relatively established) firms that engage in traditional capital markets, the crowdfunding (crowdinvesting) setting allows me to examine information acquisition related to a substantial fraction of firms' overall information environment (see Michels 2012 for a more detailed discussion). Finally, due to the internet-based nature of crowdinvesting, I can observe both investors' information acquisition related to a substantial fraction of firms' information environment (on *Companisto*) and all investment decisions that follow this information acquisition. I am therefore able to provide direct user-level evidence on investors' actual information acquisition prior to investing. Given the risky and internet-based nature of crowdinvesting, it is, however, not clear to which extent the insights gained in this study are representative for investors' information behavior in other capital markets.

My findings also contribute to the growing body of crowdinvesting literature (see Moritz and Block 2016 and Wallmeroth *et al*. 2017 for an overview of the crowdfunding literature) by providing direct evidence on crowdinvestors' information behavior before investing. A large part of this literature focuses on crowdinvestors' selection criteria. While some studies theoretically discuss potential quality signals in crowdinvesting (*e.g.*, Agrawal *et al.* 2014; Vismara 2017b), the empirical evidence suggests that the characteristics of the managing board (*e.g.*, Ahlers *et al.* 2015; Bernstein *et al.* 2017), publicly observable investments by others (*e.g.*,

Hornuf and Schwienbacher 2016b; Kim and Viswanathan 2016; Vismara 2017a), the extent of firms' disclosures on the CIP (*e.g.*, Hemaidan 2017), and the dynamics of the funding process (*e.g.*, Block *et al.* 2016; Hornuf and Schwienbacher 2016b; Dorfleitner *et al.* 2017) are related to the investment behavior of crowdinvestors. However, apart from Bernstein *et al.* (2017), who conduct a field experiment in which they randomize the information content of a newsletter to analyze the information preferences of (accredited) investors on *AngelList*, these studies typically do not analyze the information acquisition process itself but link issuance attributes to investment decisions. I extend these findings by adding an information acquisition perspective. More closely related to my study is the evidence provided by Moritz *et al.* (2015). The authors survey different participants (*i.e.*, investors, CIPs and start-ups) in the German crowdinvesting market, showing that investors regard investments of professional risk capital providers as a signal of start-up quality. I add to their findings by providing evidence consistent with the presence of professional investments affecting crowdinvestors' information acquisition process prior to investing. This result is also consistent with the evidence provided by Kim and Viswanathan (2016) whose findings indicate that the extent to which crowdfunders' investment behavior is affected by prior investments varies with the expertise of the early investors. Moreover, in line with the findings of Agrawal *et al.* (2014) who highlight the importance of accumulated capital as a quality signal for crowdinvestors, I find a negative association between investors' information acquisition and the ratio of the accumulated investment amount and the total funding amount. My findings are also consistent with related survey-based evidence. In their study Polzin *et al.* (2017) find that crowdfunders generally consider the different types of information disclosed in funding campaigns. Based on the survey data for a small group of crowdinvestors, their findings further suggest that the weight investors place on start-ups' disclosures varies with investor demographics and the investment amount.

While Google Analytics (GA) has previously been used for academic research (Crutzen *et al.* 2013; Clark *et al.* 2014) on the behavior of webpage users, to my knowledge, I am the first to use large-scale user-level GA data to study investors' information acquisition.

An important limitation of my study lies in the fact that I am only able to track registered investors' information acquisition related to the different information sections (*i.e.*, webpages) of each issuance. However, potential investors can also download a pitch deck, unaudited historical financial statements, and a three-page prospectus while being logged off. The pitch deck typically contains condensed information on key aspects of the business (*e.g.*, information on the product, target market and (expected) financial position) that is also included in the different information sections. Given the potential (complementary) association between the extent of information acquisition related to this additional information and the information included in my sample, my results should therefore be interpreted carefully.[63]

The remainder of this paper is organized as follows. Section 2 provides background information on crowdinvesting in general, specific regulatory conditions in Germany and the information environment on *Companisto*. The data and research design underlying the empirical analyses of this study are explained in Section 3. Section 4 shows descriptive empirical evidence on investors' information acquisition on *Companisto* while Section 5 concludes.

2 Institutional Background

2.1 Defining Crowdfunding and Crowdinvesting

Following Belleflamme *et al.* (2010:5), crowdfunding can be generally defined as "(…) an open call, essentially through the Internet, for the provision of financial resources either in form of donation or in exchange for some reward (…)". Prior literature typically distinguishes

[63] However, in untabulated analyses, I find that my results related to investors' information acquisition (*i.e.*, the evidence presented in Tables 5 and 6) do not substantially change when I exclude issuances that include a pitch deck (11 out of 24 issuances). Moreover, in the corresponding multiple regression analysis (*i.e.*, the evidence presented in Table 8), I include issuance-fixed effects to control for time-invariant issuance attributes.

between four major forms of crowdfunding, which differ with respect to contributors' expected returns (Schwienbacher and Larralde 2012; Hornuf and Schwienbacher 2016a,b). The donation-based model (*e.g.*, *Betterplace.org*) does not offer any direct return as most projects on these platforms have a charitable character. In the reward-based model (*e.g.*, *Kickstarter.com*), by contrast, funders typically obtain the final product (*e.g.*, a video game or music album) in return for their contribution (Ahlers *et al.* 2015; Hornuf and Schwienbacher 2016a,b).

[Figure 1 about here]

More directly related to an investment perspective are the lending-based model (*e.g.*, *Prosper.com*) and equity-based (*e.g.*, *wefunder.com*). While in the former, contributors provide loans in exchange for fixed interest payments that are often determined through a reverse auction and repayments of principal, in the second model, contributors provide capital in exchange for residual claims in the future cash flows of an early stage venture. As CIPs act as financial intermediaries between start-ups and investors by offering standardized financial contracts, they usually charge a commission of up to ten percent of the funded amount. However, this commission is only due if the funding is successful.[64] In addition to their financial service, most CIPs offer advisory services, *e.g.*, with respect to strategic marketing (Ahlers *et al.* 2015; Hornuf and Schwienbacher 2016a,b, 2017)[65]. Figure 1 depicts the crowdinvesting process.

2.2 Crowdinvesting in Germany

Crowdinvesting is generally categorized in lending-based and equity-based models. Most CIPs, however, offer mezzanine financial instruments to avoid equity-specific securities regulation. In Germany, CIPs typically employ a special form of subordinated loans to enable start-ups to raise capital without being required to disclose an extensive IPO prospectus (Klöhn

[64] Investments are returned to investors if the investment amount is not raised within the funding period.

[65] Note that the discussion in the entire previous paragraph is based on Ahlers *et al.* 2015 as well as Hornuf and Schwienbacher (2016a,b, 2017).

and Hornuf 2012; Hornuf and Schwienbacher 2017)[66]. Given their subordinated nature, in case of bankruptcy, these loans are only repaid once the claims of other debt-holders have been served. During a pre-defined holding period, investors receive fixed interest payments. However, firms can also issue subordinated loans that offer investors a pro-rate share in the profits and the value development of a firm. As these securities essentially reflect a risk-and-reward exposure typically associated with equity, I refer to these loans as 'equity-like'. However, voting rights are typically not transferred (Hornuf and Schwienbacher 2016b). On *Companisto*, one of the largest German CIPs, firms can issue both debt- and equity-like securities with the former issuance being less risky given that (a) it can only be issued by already "established growth companies" (Companisto 2017) and as (b) investors' cash flows are less volatile.[67] To minimize the impact of fraudulent activities, German securities regulation limits the maximum investment amount without the obligation to register to 2.5 million (10,000) Euro per issuance (investor).[68]

2.3 Disclosures on Companisto

This study aims to provide a description of crowdinvestors' information acquisition. Thus, it is crucial to understand which kind of information start-ups placing a funding on *Companisto* (are required to) provide. According to German securities regulation, firms must provide unaudited financial statements and briefly discuss material risks and rewards associated

[66] Note that the discussion in the entire previous [following] paragraph is based on Klöhn and Hornuf (2012) and Hornuf and Schwienbacher (2017) [Hornuf and Schwienbacher (2016b)].

[67] Naturally, the specifics of the investment forms as well as the available set of information (*i.e.*, the (mandated) content and structure of start-ups' disclosures on *Companisto*) are subject to constant change (*e.g.*, as a result of regulatory changes). The information presented in the remainder of this paper is therefore not necessarily representative for *Companisto*'s investment forms and the available set of information for the time before and the time after my sample period (see Hemaidan 2017 (Gassen and Hemaidan 2017) for a description of the investment forms and information requirements on Companisto before (after) my sample period). Also, the disclosure requirements discussed in this paper do not consider firms' contractual post-funding information obligations on *Companisto*.

[68] See Klöhn *et al.* (2016) [and Hornuf and Schwienbacher (2017)] for a detailed discussion of the regulation of crowdinvesting in Germany [and in other countries].

with the issuance in a three-page prospectus.[69] However, the information provided in these prospectuses is often extremely condensed and not very comprehensive.

[Figure 2 about here]

To address this lack of publicly available information, *Companisto* requires start-ups to disclose additional information including a general "Overview" of the business model, the product(s) and target market(s) in a separate section of the issuance (see Figure 2). As this typically also includes other factors, *e.g.*, a SWOT analysis, it should be relevant for potential investors. This intuition is supported by related evidence on the selection criteria of Business Angels which indicates that sophisticated private risk capital providers consider the size (Feeney *et al.* 1999) and growth (Mason and Rogers 1997) of the target market as well as the product (status) (Mason and Harrison 1996, 2002) in their investment decisions (see Maxwell *et al.* 2011 for an overview of business angels selection criteria). In addition, the "Overview"-Section contains a pitch video, in which the founders introduce themselves and their businesses. Prior research on crowdinvestors' investments decisions (*e.g.*, Moritz *et al.* 2015; Hemaidan 2017) suggests that the (length of the) pitch video is positively associated with crowdinvestors decision to invest in a start-up. The pitch video further allows investors to get a personal impression of the founders who use the pitch video to present themselves and their company in the video (Moritz *et al.* 2015). The evidence presented by Mason and Stark (2004), for example, suggests that both the individual attributes of the entrepreneurs as well as the composition of the managing team (*i.e.*, the range of attributes) are highly relevant for the investment decisions of professional risk capital providers. Related research from P2P-lending further indicates that soft factors (*i.e.*, appearance-based judgements) are considered by investors in their decision-making (Duarte *et*

[69] Moreover, in accordance with the Introductory Act of the German Civil Code (EGBGB), a three-page consumer information sheet is provided. This information is legally mandated for all types distance (*e.g.*, internet) or off-premises sales and includes legal information on the (risks of the) product and all rights related to buyer protection.

al. 2012; Ravina 2012). Taken together, this section should be highly relevant for potential investors.

[Figure 3 about here]

Aside from historical financial statements, firms are required to disclose selected financial forecasts (*e.g.*, EBIT) for the subsequent years accompanied by a discussion of the assumptions underlying these forecasts in the "Financial Data"-Section of each issuance (see Figure 3). Moreover, *Companisto* mandates firms to provide information related to the (legal) structure of the start-up (*e.g.*, the shareholder structure, the number of employees). In addition, firms often voluntarily disclose information on key performance indicators (KPIs) and forecasted financial statements (*i.e.*, projected income and cash flow statements) as well as information on the firm's investment strategy and (expected) liquidity, all of which related research identifies as relevant for professional risk capital providers (see Maxwell *et al.* 2011). As previously discussed, while investors might not necessarily rely on this information when assessing the firm's value and expected financial position, respectively, they might still screen it as it is potentially indicative of the attributes and quality of the managing team. This would be consistent with related evidence (*e.g.*, Ahlers *et al.* 2015; Bernstein *et al.* 2017; Hemaidan 2017; Polzin *et al.* 2017) which generally indicates that crowdinvestors consider firms' voluntary (financial and management team-related) disclosures in the scope of their investment decisions.

[Figure 4 about here]

Furthermore, firms are required to disclose profiles of the members of the managing team in the "Team"-Section of each issuance (see Figure 4). In addition to narrative disclosures on their (professional) background, *Companisto* requires start-ups to include a picture and links to the social media-profiles of each member of the managing team. Given that the pitch video typically includes information on the founders of the start-up, it is hard to assess the incremental

information content of this section for investors that have already watched the pitch video. However, not all pitch videos contain detailed information on the educational and professional background of each member of the managing team. I therefore believe that the additional information included in this section is generally relevant for potential investors.

[Figure 5 about here]

Firms are further encouraged to directly interact with (potential) investors via both an "Updates"-Section (*i.e.*, regular information updates regarding the development of the start-up) as well as a forum (*i.e.*, the "Comments"-Section). Also, *Companisto* shows all prior investments by other investors (including user names as well as the timing and amount of investment) in a separate section of each issuance (see Figure 5).[70]

The order of the different information sections is constant across issuances.[71] The "Overview"-Section represents the landing (*i.e.*, first) page of each issuance and is followed by the "Updates", "Financial Data"-, "Team"-, "Comments"- and "Prior Investments"-Section. Building up on related evidence that indicates that the location of information in financial statements affects retail investors' information behavior (Maines and McDaniel 2000; Hodge *et al.* 2010), it can be expected that investors' information acquisition on *Companisto* should be affected by the way the information is structured (*e.g.*, investors might be less likely to access and spend significantly less time on the 'last' information sections of each issuance).

In addition to the information presented in the above-mentioned information sections (*i.e.*, tabs), each issuance includes a download section in a sidebar that is visible (*i.e.*, can be

[70] Investments by others are also disclosed on the starting page of *Companisto*. Thus, it is possible for investors to see this information without accessing the issuance-specific "Prior Investments"-Section. Please note that the original name of this information section on *Companisto* is „Companists" (*i.e.*, the term that *Companisto* uses when referring to its registered investors).

[71] However, some issuances contain additional information sections. In my sample, five issuances include an additional information section (*e.g.*, with additional videos). I control for this in my research design by, depending on the respective analysis, adding a binary coded variable that takes on the value (0) 1 if the issuance exhibits (no) additional information sections or by including issuance-fixed effects.

accessed) on all information sections and that comprises unaudited financial statements, a pitch desk, the participation contract as well as the prospectus and the consumer information sheets are available in PDF format.

3 Data and Research Design

3.1 Data

[Table 1 about here]

I start my sample selection by gathering investor-level data from *Companisto*. Between June 2012 and January 2017, a total of 68,450 registered investors faced 77 issuances resulting in 63,436 investments. As the focus of my study lies on investors' information acquisition prior to these investments, I additionally gather Google Analytics data. User-level webpage tracking is a relatively new feature of GA which requires the implementation of an additional interface by the operator of the webpage. For *Companisto*, this data has been available since October 2015. For the period of October 2015 to January 2017, I gather user-level data on crowdinvestors' information acquisition. During this period, registered and logged in investors visited 2,421,417 separate webpages on *Companisto* with most of these page views being not directly related to issuances. Thus, I exclude 1,543,959 page views to narrow my sample on investors' information acquisition related to issuance-related disclosures. I merge the remaining 877,458 page views with the investor-level data and retain a total of 28,505 investors with 20,326 investments in 33 start-ups.

As some issuance-specific information sections (*i.e.*, the "Updates"- and the "Prior Investments"-Sections) can be accessed by investors while being logged off, I only consider page views related to information sections that can only be accessed in logged in mode (*i.e.*, "Overview", "Financial Data", "Team" and "Comments"). Therefore, I further exclude 429,126 issu-

ance-related page views. Next, I exclude 125 investors due to missing investor-specific information. To reduce the bias from investments by friends or family members of a start-up's founders, whose investment decisions might be taken independently from start-ups' information environment on the CIP (*e.g.*, Agrawal *et al.* 2015), I drop 3,411 investors who, as of January 2017, have invested in less than two distinct start-ups on *Companisto*. Moreover, as I want to explore investors' information acquisition prior to investing in a start-up, I drop 247,380 page views which did not result in an investment, or occurred after an investment in the respective firm. Furthermore, I exclude all investments in start-ups whose funding round started before the sample period as well as investments related to issuances that represent the second funding round of firms on *Companisto*.[72]

Finally, as I find that some firms only provide information in German, I exclude 593 investors that are not located in a German-speaking country. I end up with a final sample of 118,463 page views by 3,128 investors making 10,114 investments in 24 start-ups.

3.2 Variables

3.2.1 Information Acquisition

To measure investors' information acquisition, I define two variables, *page_view* and *content_pt*. Both variables are measured on the investor-issuance-content type-level with *page_view* being binary coded and taking on a value of one (zero) if investor *i* has (not) accessed information section *k* of issuance *j* before her investment. My second proxy, *content_pt*, on the other hand, aggregates the time (*i.e.*, minutes) for which investor *i* has opened a single webpage related to issuance *j* in her web browser (*pagetime*) on the issuance-content type-level. This

[72] I thereby exclude two issuances representing second funding rounds on *Companisto*, as a successful first issuance might serve as an additional information signal that could influence investors' information acquisition.

allows me to examine factors associated with the total time that investors spend with the acquisition of different types of information provided in each listing.[73] Given that Google Analytics is not able to record the *pagetime* related to page views that reflect either the first or the last page accessed during a session[74], I drop all observations where *content_pt* includes page views with a *pagetime* of zero (*i.e.*, the default value that GA reports for all first or last page views of a session).[75]

In contrast to *page_view*, any empirical evidence based on *content_pt* does not allow for a clear interpretation. While *content_pt* can be interpreted as the extent of investors' information acquisition, it should also be affected by investors' ability to process the respective information. This should be particularly considered when interpreting differences in the distribution of *content_pt* across different groups of investors. However, given that a large fraction of firms' disclosures presented in the different information sections on *Companisto* is non-financial and qualitative, it is not clear to which extent investors differ in their ability to process this information. Given the fixed structure of crowdinvestors' information environment on *Companisto*, investors' experience on *Companisto* should be negatively associated with the time that they need to identify potentially relevant information. However, it might also be that investors' information preferences change with their level of experience (*e.g.*, Bernstein *et al.*

[73] To avoid bias of long webpage views that were unrelated to information acquisition, I winsorize *pagetime* for all values above 120 minutes.

[74] As Google Analytics measures "time on page" (*i.e.*, *pagetime*) as the time between two page views (*i.e.*, two hits that redirect the user to a new html-page), a reference point within a webpage is needed to accurately calculate *pagetime*. As for the first and last page view of a session such a reference point on the respective site is missing, GA is not able to correctly measure "time on page" which results in a displayed *pagetime* of zero.

[75] For each information section (*i.e.*, specification of *content_pt*), I exclude all investments with at least one *page view* related to the respective information section that has a value of zero. Thus, the samples of investments used for my analysis of *content_pt* differ across information sections. It should further be noted that I thereby drop page views where the actual *pagetime* is zero, *e.g.*, where the investor just clicks through the different information sections (*i.e.*, tabs) of an issuance without previously screening the information.

2017) and/or that they rely relatively less on the additional information provided in the download section of each issuance. It is therefore *ex ante* unclear how crowdinvesting experience should affect investors' information acquisition.

3.2.2 Investor Attributes

To investigate how investors' information acquisition varies with their demographics, I include *age* and *gender* (binary coded, with one indicating that an investor is male). Moreover, I account for investors' level of crowdinvesting experience on *Companisto* by including the number of unique start-ups in their portfolio (*pfsize*) as well as the time since they first registered on *Companisto* (*exp*). Both *pfsize* and *exp* as well as *age* are measured at the time *t* that investor *i* first accesses information section *k* of start-up *j*.

3.2.3 Issuance Attributes

Furthermore, to examine how issuance attributes are associated with investors' information acquisition, I build up on prior research (Ahlers *et al.* 2015; Moritz *et al.* 2015; Vismara 2017a) and include a set of variables that capture issuance attributes. First, I include a binary coded variable with one (zero) indicating the issuance of *debt* [equity(like)] securities. Moreover, I add an indicator variable (*prior_VC*) that takes on the value of one if at least one professional risk capital provider (*i.e.*, Business Angel and/or Venture Capital Company) is already invested in the start-up prior to the start of the crowdinvesting campaign on *Companisto*. If investors believe that respective investments reflect the positive outcome of an extensive due diligence by investors that are more sophisticated than themselves[76], they might free-ride on others' efforts and/or expertise by decreasing their own information acquisition (Hornuf and

[76] This notion is consistent with the survey evidence provided by Moritz *et al.* (2015:326). When asked about the relevance of VC and BA investments for his own investment decision, one investor stated: "(…) if business angels are already invested, there must be more behind it. They have a deeper look into the company, as they are directly investing thousands of Euros". Another investor points out: "[i]f I see that an external investor already participated like a business angel or a public development bank, then I am more interested as the company already has a proof-of-concept".

Schwienbacher 2016b). Professional investments might generally be regarded as (additional) signals for a start-up's quality, which would be in line with the evidence provided by Kim and Viswanathan (2016) who find that the effect of early investments on later investors increases in the investment expertise of the early investors. Apart from the financial support, start-ups often also benefit from the business advice (Sapienza 1992) and network (Barry *et al.* 1990) as well as the monitoring services (Gompers 1995) that professional risk capital providers usually offer. Investors might therefore regard the co-investment of professional risk capital providers as beneficial for the future success of the start-up (Baum and Silverman 2004; Hsu 2004). As their information acquisition should aim at the assessment of the risk and return profile of a start-up, the presence of co-investments might decrease information asymmetry and thus the time that investors spend on processing other (more complex) information (Agrawal *et al.* 2014). Following this rationale, the presence of a *patent* (binary coded with one indicating that the start-up holds at least one patent) might have a similar effect on investors' perception of the risk related to a start-up investment and (thus) their information acquisition (Häussler *et al.* 2012; Ahlers *et al.* 2015; Moritz *et al.* 2015). However, it is also possible that investors only acquire (additional) information on start-ups if certain, *i.e.*, the above discussed criteria, are met, which would imply a positive association with both dependent variables, *page_view* and *content_pt*.[77] Thus, the direction of the relation between my two measures of information acquisition and the presence of potential quality signals is unclear. This also applies to the number of years that a firm has been operating under its legal form (*years_i_b*) which might be regarded as a proxy for founders' commitment to the venture (Ahlers *et al.* 2015). However, in combination with other firm attributes (*e.g.*, no VC shareholder, low growth in revenues and (thus) cash flow) a long operating history might also be regarded as a bad signal of a firm's quality.

[77] Given the rather standardized information structure of the issuances in my sample, investors should be able to systematically screen issuances with regard to the presence of the discussed factors.

To add a further control for the business stage of a start-up, I include the total number of employees (*#staff*).

In addition, to account for the extent of start-ups' disclosures on *Companisto*, I control for the number of words included in firms' narrative disclosures (*discl*), the number of figures (*#figures*) and tables (*#tables*) as well as the length (in minutes) of the pitch video (*vid_length*) included in the "Overview"-, "Team"- and "Financial Data"-Section of each issuance. Moreover, I include a binary coded variable (*add_tabs*) that takes on the value one (zero) if an issuance includes additional information sections (*e.g.*, in which more technical information and/or videos are presented).

3.2.4 Funding Dynamics

As the dynamics of the funding process might also affect investors' information acquisition, I build up on prior literature (Block *et al.* 2016; Hornuf and Schwienbacher 2016b; Kim and Viswanathan 2016; Vismara 2017a) and include several variables that are measured at the date *t* that investor *i* first accesses information related to issuance *j*. This includes the total number of information updates (*#updates*) a start-up provides during the crowdinvesting campaign. I further add the ratio of cumulative investments in start-up *j* at *t* to the total amount received during the crowdinvesting campaign (*%funded*). Also, I include the cumulative number of investors (*#investors*) in start-up *j* at *t*. By including *%funded* and *#investors* (*#updates*), I (indirectly) control for the stage of the crowdinvesting campaign which should be, to some extent, mechanically associated with the extent of investors' information acquisition. Additionally, to measure the incremental effect of professional investments that are conducted and disclosed during the crowdinvesting campaign, I include a binary coded variable (*prof_invested*) with one indicating that at least one investment of at least 1,000 Euro by a firm whose name indicates a professional risk capital provider is displayed in the "Prior Investments"-Section of issuance *j* (*i.e.*, invested during the crowdinvesting campaign). Analogously to my expectations regarding

the potential effect of *prior_VC* (measured *before* the crowdinvesting campaign) on investors' information acquisition, the investment of a professional risk capital provider *during* the crowdinvesting campaign might decrease investors' incentives to acquire and process information on their own (Block *et al.* 2016; Hornuf and Schwienbacher 2016b; Kim and Viswanathan 2016; Vismara 2017a) [78].

Finally, I include the amount that investor *i* invests in start-up *j* and thus a variable that varies on the investor-issuance-level.[79]

4 Results

4.1 Descriptive Statistics

4.1.1 Investor-Level

[Table 2 about here]

[Table 3 about here]

Tables 2 and 3 provide descriptive statistics on the 3,128 investors in my sample. Specifically, Table 2 gives an overview of the investment amount, the portfolio size (*pfsize*, *i.e.*, the number of unique start-ups in the portfolio) and experience (*exp*, *i.e.*, the time since registration) on *Companisto* for different age groups of investors. The average investor in my sample has been registered for less than two years and has invested in roughly eight distinct start-ups since registering on the CIP. Moreover, I find that the majority of investors (93 percent) is male and relatively young as almost 65 percent investors in my sample are aged between 20 and 39 years. Still, there are 107 investors that are aged 60 or older. As Table 2 indicates, there is a

[78] Note that the discussion in the entire previous paragraph is based on Block *et al.* 2016, Hornuf and Schwienbacher 2016b, Kim and Viswanathan 2016, and Vismara 2017a.

[79] In case that an investor invests more than once during an issuance, I only consider her first investment into the start-up.

high positive correlation between investors' age and their average investment amount. Additionally, I find a positive association between investors' age and their portfolio sizes. Panel B of Table 3 further reveals that male investors, on average, seem to hold larger portfolios on *Companisto* than their female counterparts.

It is, however, important to note that I am only able to observe investment experience, *i.e.*, *exp* and *pfsize*, on *Companisto* which might not be representative for investors' overall level of (crowd)investing experience. However, in Germany, crowdinvesting only emerged in 2011 with *Companisto* being among the first CIPs. Taking further into account that *Companisto* is one of the leading CIPs in Germany, I believe that the bias of non-observable crowdinvesting experience is, on average, low.[80]

4.1.2 Firm-Level

[Table 4 about here]

Table 4 provides descriptive statistics for the 24 start-ups in my sample. Most firms issue 'equity-like' securities. Professional risk capital providers (*e.g.*, Venture Capital firms and/or Business Angels) were already invested in half of the start-ups before the crowdinvesting campaign on *Companisto* started. I can therefore analyze if a prior professional investment (*prior_VC*) serves as a quality signal influencing investors' information acquisition. Narrative firm-level disclosures presented in the core information sections of an issuance on *Companisto*

[80] Nevertheless, I acknowledge that I am unable to identify whether investors gained other risk capital experience. I believe that it is unlikely that a substantial part of the sample has provided venture capital for a longer period of time, but I cannot definitely rule this out. Moreover, I am unable to identify investors' overall investment experience. Generally, the overall investment experience of an investor should be positively correlated with her age.

(*discl*) encompassed 4,871 words on average, reflecting start-ups' low overall information environment.[81] More than one third of the firms in my sample hold at least one patent. Nevertheless, the presence of a patent is not statistically associated with the extent of start-ups' narrative disclosures (*discl*). Disclosure quantity is, however, positively associated with the number of figures and tables presented on *Companisto*.

4.1.3 Investment-Level

[Table 5 about here]

Table 5 (Panel A) provides descriptive statistics for the 10,114 investments in my sample. The minimum investment amount on *Companisto* is five Euros.[82] Arguably, this might rather reflect consumption than a rational investment. The average (median) investment amounts to 490 (100) Euro with at least 25 percent of all investments (p75) being equal to or above 500 Euro. This is substantial enough to believe that a large fraction of all investments is accompanied by a structured information acquisition. Panel A further reveals that only in 50 (36) percent of all investments, the "Financial Data" ("Comments")-Section is accessed [*pv_financials* (*pv_forum*)=1] prior to an investment in the respective start-up. Information on the managing team is accessed (*pv_team*=1) prior to only 21 percent of all investments. This suggests that investors tend to ignore a significant proportion of the information available on *Companisto*. In contrast, the "Overview"-Section which includes, for example, information on the business model and market along with the pitch video is accessed prior to 97 percent of all

[81] It is important to note that this does not contain the number of words included in updates and the information included in the additional disclosures (*e.g.*, historical financial statements, three-page prospectus) that are available for download.

[82] In June 2017, the minimum investment amount on *Companisto* has been raised to 100 Euro.

investments (*pv_overview*=1) which is not surprising given that investors are automatically directed to this section after accessing an issuance on *Companisto*.[83]

Univariate correlations (Panel B in Table 5) reveal that the likelihood of an investor accessing an information section (other than the "Overview"-Section) is negatively associated with the funding progress, *i.e.*, the later the stage of the crowdinvesting campaign, the lower the probability that investors access one of the information sections. In contrast, an investment equal to or above 1,000 Euro by a professional risk capital provider (*prof_invested*=1) in the scope of the crowdinvesting campaign seems to be positively associated with the likelihood of investors' accessing start-ups' different information sections (except for the "Overview"-Section). In addition, I find that investors' investment amounts as well as their *age*, experience (*exp*) and portfolio size (*pfsize*) are negatively associated with the likelihood of them accessing the "Financial Data"- and "Team"-Section.

4.1.4 Content-Type-Level

[Table 6 about here]

Table 6 presents descriptive statistics for the investment-related page views in my sample by content type (*i.e.*, issuance section) for different sub-samples of retail investors. Given the generally high average values and low variance of *page_view* for the "Overview"-Section, I don't find any statistically significant differences between different types of retail investors. Therefore, in the following discussion, I will focus on my results related to the other information sections. For the interpretation of my results, it is important to consider the different nature of

[83] However, if investors access a crowdinvesting campaign without being logged on to *Companisto* and are thus directed to the (logged off, *i.e.*, trimmed-down, version of the) "Overview"-Section and select one of the other information sections, they are required to log on to *Companisto*. If investors then log on, they are directed to the selected information section. If they don't access the "Overview"-Section in logged on mode before investing in the respective start-up, *page_view* takes on a value of zero with regard to the "Overview"-Section of the respective issuance.

the four information sections. While the information in the "Overview"-, "Team"- and "Financial Data"-Section is provided by the firm (before the start of the crowdinvesting campaign), the 'Forum' also contains the questions and comments posted by investors.[84] Moreover, the interpretation of my proxies for investors' information acquisition (*i.e.*, *page_views* and *content_pt*) differs for the Forum as it is not clear whether, for a given crowdinvesting, an investor uses this section primarily to inform herself by reading others posts or whether she uses this section mainly to respond to the questions and comments of the start-up or other investors.

My results show that male investors are more likely to access the different information sections of an issuance prior to investing. This difference is (statistically) significant with the difference in likelihoods amounting to roughly 15 (7) [7] percent on average for the "Financial Data" ("Team") ["Comments"]-Section of each issuance.

In a second step, I split my sample by *pfsize* allowing me to investigate the association between investing experience on *Companisto* and investors' information acquisition. Prior literature on retail investors' information usage reveals that their information choice (*e.g.*, Elliott *et al.* 2008) and ability to process (complex financial) information (*e.g.*, Frederickson and Miller 2004) varies with their level of sophistication (see Cascino *et al.* 2013, 2014). To investigate the role of sophistication in my setting, I use the number of investments in unique start-ups that investors have conducted on *Companisto* as a proxy for their level of (crowd)investing experience. Specifically, I split my sample by distinguishing between investors that (at *t*) have invested in less (equal to or more) than five distinct start-ups. While I don't find any statistically significant difference between the two groups for the "Financial Data"-Section, my findings

[84] Start-ups have the choice to either answer investors' comments privately or to answer them publicly. In the (first) latter case, both the comment or question by the investor as well as the start-ups' answer are (not) publicly displayed in the "Comments"-Section. However, if start-ups fail to answer timely, the comment or question is automatically posted publicly in the Forum.

suggest that more experienced investors are, on average, less (more) likely to access the "Team" ("Comments")-Section of an issuance.

Finally, I split my sample by the average amount that an investor has invested per start-up on *Companisto*. Given that the acquisition and processing of information is costly, the time that investors spend on analyzing start-ups' disclosures on the CIP should be positively associated with their investment amount, *i.e.*, the potential returns from using that information for their investment decisions (*e.g.*, Grossman and Stiglitz 1980; Diamond and Verrecchia 1981). Moreover, investors that invest equal to or more than 500 Euro per start-up (*e.g.*, Business Angels), are likely to systematically differ from other investors (*e.g.*, those that invest five Euro per start-up) with regard to their motivation to engage in crowdinvesting and/or their overall level of investing experience. Compared to low average amount investors whose main motivation to engage in crowdinvesting might be to support entrepreneurs and/or innovative business ideas, investors with high average investments are more likely to focus on the maximization of their investment returns (*i.e.*, screen start-ups' disclosures) (*e.g.*, Hornuf and Schwienbacher 2016b). In line with these expectations, I find that investors with comparably high investment amounts are more likely to access the different information sections of an issuance with the mean differences for the two groups (≥ 10 percent for all information sections) being (statistically) significant.

[Table 7 about here]

Consistent with the evidence presented in Table 6, I find that investors with higher average investment amounts are not only more likely to access the different information sections of a start-up, but also seem to spend significantly more time on the acquisition of information presented in the different information sections of a start-up (see Table 7). Moreover, compared to female investors, male investors seem to spend significantly more time on the acquisition of

information presented in the "Financial Data"- and "Team"-Section. With regard to investors' crowdinvesting experience, the results are again mixed, indicating that more experienced investors tend to spend significantly less (more) time on the acquisition of information in the "Overview"- and "Team"- ("Financial Data"- and "Comments")-Section of an issuance.

Regarding the interpretation of the findings presented in Table 6 and 7 it is important to keep in mind that the relative share of the different groups of retail investors differs across issuances. Therefore, the presented evidence might reflect differences in investors' preferences regarding certain start-up attributes that might (in)directly affect firms' disclosure strategy rather than differences in investors' information behavior. Moreover, given the fact that investors might systematically differ in their ability to process the presented information, differences in *content_pt* do not necessarily reflect differences in the extent of investors' information acquisition.

Taken together, the previously presented evidence indicates that crowdinvestors tend to neglect a substantial fraction of firms' (financial) information prior to investing. The fact that investors access firms' projected financial statements prior to only about 50 percent of their investments is particularly striking in face of start-ups' low overall information environment (on *Companisto*). Also, given prior evidence on the importance of the managing team for investment decisions related to start-up-investments (*e.g.*, Mason and Stark 2004; Ahlers *et al.* 2015), it is rather surprising that the "Team"-Section, which also includes links to the founders' social network accounts (*e.g.*, Facebook, LinkedIn) is not even accessed in 79 percent of all investments. Finally, I find evidence consistent with crowdinvestors' information acquisition varying with their demographics, their level of crowdinvesting experience and average investment amount.

4.2 Multiple Regression Analyses

4.2.1 Information Acquisition and Investor Type

To further test the association between investor attributes and information acquisition, I run multiple OLS regressions in which I employ both *page_view* (Columns 1 to 4) and *content_pt* (Columns 5 to 8) as dependent variable. To control for differences in investor preferences with regard to (time-invariant) start-up attributes that might be related to investors' information acquisition, I include issuance-fixed effects. To further address the potential influence of unobserved heterogeneity, I include quarter-, year- and country-fixed effects and cluster standard errors at the issuance-level. Finally, I add all investor- and investment attributes as well as the proxies for the funding dynamics as controls. Table 8 displays the related results.

[Table 8 about here]

Consistent with the evidence presented in Tables 6 and 7, I find that both *male* investors as well as investors with relatively high average investment amounts (*Øamount* ≥ 500) are more likely to access the "Financial Data"-, "Team"- and "Comments"-Section of a crowdinvesting prior to investing into the respective start-up. Consistent with this evidence, I find that the latter group of investors, on average, also spends significantly more time with the acquisition of information presented in the "Overview"-, "Team"- and "Comments"-Section. Also, my results indicate that, prior to investing, investors with more experience in crowdinvesting (*pfsize* ≥ 5) are less likely to access the "Team"-Section and spend significantly less time on the "Overview"-Section.[85] These findings are consistent with the evidence provided by Bernstein *et al.* (2017), which suggests that crowdinvestors' information preferences are associated with their level of crowdinvesting experience.

[85] In Appendix A2, the multivariate regression results for different cutoffs of *pfsize* and *Øamount* are presented.

The evidence presented in Table 8 further reveals a negative association between investors' *age* and the time since their registration (*exp*) on *Companisto* and their likelihood of accessing the different information sections of a start-up. In line with these findings, the results of the regression with *content_pt* as the dependent variable suggest that (older) investors that have been registered on *Companisto* longer also spend significantly less time on the ("Overview"-, "Team"- and) "Financial Data"-Section before investing.

4.2.2 Information Acquisition and Funding Dynamics

To investigate the role of the funding dynamics for retail investors' information acquisition, I run multiple OLS regressions in which I again employ both *page_view* (Columns 1 to 4) and *content_pt* (Columns 5 to 8) as the dependent variables. Moreover, to investigate how this association varies with investors' level of crowdinvesting experience, I use the number of unique start-ups in their portfolio on *Companisto* as a proxy for their (crowd)investing experience. Specifically, I employ *type* as an indicator that takes on the value 0 (1) if investors have invested in less (equal to or more) than five distinct start-ups and interact *type* with all independent variables of interest. As this analysis focuses on the role of funding dynamics for investors' information behavior, I employ issuance-, investor-, quarter- and year-fixed effects and cluster standard errors at the issuance-level. Table 9 displays the related results.

[Table 9 about here]

I find a negative and statistically significant association between the likelihood of investors accessing the "Financial Data"-Section of a crowdinvesting and *%funded*[86], with this association being more pronounced for more experienced investors (Column 2). This indicates

[86] Appendix A2 includes the pooled sample results which indicate a negative and statistically significant association between the likelihood of investors accessing the "Financial Data" (and "Team")-Section of a crowdinvesting and *%funded*.

that investors are less likely to access start-ups' financial projections at later stages of the funding round. My results further suggest that inexperienced investors are less likely to access the Forum after observing a professional investment.[87]

[Table 10 about here]

To further explore how crowdinvestors' information acquisition varies with their characteristics, I re-specify *type* to take on the value 1 (0) if an investor, on average, invests equal to or more (less) than 500 Euro per investment. To analyze how the association between crowdinvestors' information acquisition and the dynamics of the funding process varies with crowdinvestors' (average) investment amounts, I re-run the above presented regressions (see Table 10).

My results indicate that the previously observed negative association between *%funded* and *page_view* does not vary with investors' average investment amount. However, for investors with relatively low average investment amounts, I find that they are less likely to access the "Team"-Section at later stages of the funding process.[88] Moreover, my results indicate that, compared to low average amount investors, individuals that, on average, invest 500 Euro or above per start-up-investment are more likely to decrease their information acquisition related to the "Team"-Section after a professional investment (*prof_invested*=1) during the crowdinvesting campaign.

[87] In untabulated sub-sample regressions, I find that this association is not statistically significant for investors whose portfolio comprises five or more distinct start-ups.

[88] In untabulated sub-sample regressions, I find that this association is not statistically significant for investors that invest 500 Euro or more per start-up investment.

Taken together, the results presented in this section suggest that retail investors' information acquisition is negatively associated with the presence of investments by others. Moreover, I find that this association varies with investors' level of crowdinvesting experience as well as their average investment amount.

4.2.3 Information Acquisition and Issuance Attributes

In a next step, I exclude issuance-fixed effects and re-run all regressions to test how crowdinvestors' information acquisition varies with selected issuance attributes. Again, I use *type* as an indicator for investors' crowdinvesting experience. My set of control variables includes proxies for the extent of firms' disclosures on *Companisto*.

[Table 11 about here]

The results presented in Table 11, with *page_view* as dependent variable (Columns 1 to 4), suggest that the presence of a *patent* is negatively associated with the likelihood of investors accessing the "Overview"-Section of an issuance. Moreover, I find that investors are significantly less likely to access the "Overview"- and the "Financial Data"-Section of an issuance if a debt [instead of an equity(like)] security is being issued in the crowdinvesting campaign. This suggests that information acquisition is positively associated with investment risk.

Moreover, I find that for firms that hold patents prior to the start of the crowdinvesting campaign investors spend significantly less time on the acquisition of information presented in the "Financial Data"-Section of the respective issuance. While this result is consistent with prior evidence on the decision criteria of traditional risk capital providers (*e.g.*, Häussler *et al.* 2012), it further indicates that certain firm attributes already affect the information acquisition process itself. In contrast, I find that co-investments of professional investors prior to the crowdinvesting campaign increase the time that investors spend in the Forum of an issuance.

[Table 12 about here]

To analyze how the role of issuance attributes for crowdinvestors' information acquisition differs with their average investment amounts, I re-specify *type* (*Øamount* ≥ 500=1; 0 otherwise) and re-run all regressions (see Table 12).

My results indicate that, for start-ups that hold at least one patent and/or have VC shareholders prior to the crowdinvesting campaign, individuals with an average investment of 500 Euro or above spend less time on the acquisition of information in the "Team"-Section than investors with relatively low average investment amounts.

In sum, I find that the presence of certain firm attributes that retail investors' might regard as indicative for the quality of an investment is negatively associated with retail investors' information acquisition.[89] However, when interpreting the results presented in this section, it is important to note that firms that differ in the above mentioned attributes (*e.g.*, that hold a patent) are likely to also differ systematically in other dimensions that might directly affect investors' information acquisition but are not accounted for in my empirical design.

5 Conclusion

In this paper, I document retail investors' actual information acquisition on *Companisto*, one of the largest German crowdinvesting platforms, by analyzing user-level Google Analytics data. This relatively novel type of data allows me to link investors' information behavior to their personal characteristics including their investment activity. In line with prior evidence on the information usage of retail investors in traditional capital markets, I find that crowdinvestors tend to ignore a large fraction of start-ups' disclosures on *Companisto*. My results further suggest that investors' information acquisition varies with their demographics, their level of

[89] This does, however, not hold for the Forum, for which the direction and statistical significance vary across investor types.

crowdinvesting experience as well as their average investment amount. Specifically, I find that male (high average amount) investors spend considerably more time on information acquisition than their female counterparts (investors with a low average investment amount). Moreover, I find a negative association between both investors' age and the time since they first registered on *Companisto* and their information acquisition. My findings further indicate that retail investors decrease their information acquisition over the crowdinvesting campaign (*i.e.*, as the number of investments by others increases) and that they spend less time on the acquisition of information in the presence of potential signals of start-up quality. Specifically, I find that the acquisition of information related to the managing team of a start-up significantly decreases after a publicly disclosed investment by a professional investor during the crowdinvesting campaign. Also, investors spend significantly less time on the acquisition of forward-looking financial information if the start-up holds at least one patent. Lastly, my findings suggest that information acquisition is positively associated with the level of investment risk.

To my knowledge, I am the first to provide large-scale user-level empirical evidence on investors' actual information acquisition prior to investing. However, my study faces several limitations. I am, for example, unable to rule out that my data is biased from both, very long and very short webpage sessions that were unrelated to information acquisition. Nevertheless, untabulated robustness checks reveal that my results are materially unchanged, if I tighten or loosen my exclusion thresholds. Thus, I believe that Google Analytics, on average, tracks a reliable representation of investors' information acquisition process. Furthermore, my evidence is not generalizable to traditional equity markets. However, I believe that regulators and researchers interested in these relatively novel forms of financial markets can learn from my evidence as retail investors engaging in crowdinvesting seem to exhibit similar behavioral patterns as documented by prior literature.

A Appendix

A1 Variable Definitions

Variable/Index	Definition
j	Issuance (*i.e.*, start-up): Given that, in my sample, there has been no firm that collected funds through more than one crowdinvesting campaign, the number of firms equals the number of issuances in the sample
k	Content type (*i.e.*, the information section of each issuance): the information structure on *Companisto* is equal across issuances and comprises the following information sections (*i.e.*, content types): "Overview", "Updates", "Team", "Financial Data", "Comments" and "Prior Investments"
t	(If not differently specified:) Date at which investor i (first) accesses a webpage with contents related to issuance (*i.e.*, start-up) j
Information Acquisition	
$content\_pt_{i,j,k,t}$	Total time (*i.e.*, minutes) investor i has opened webpages with content type (*i.e.*, section) k of issuance j in her internet browser before investment; t reflects the date when investor i first accessed contents (*i.e.*, webpages) related to the issuance j
$page\_view_{i,j,k,t}$	Binary coded variable with (0) 1 indicating that investor i has (not) accessed webpages with content type (*i.e.*, section) k of issuance j before investment; t reflects the date when investor i first accessed content type k (*i.e.*, webpages) related to the issuance *j; pv_overview* (*pv_financials*) [*pv_team*] {*pv_forum*} measures the page views related to the Overview (Financial Data) [Team] {Comments} section of each crowdinvesting
Investor Attributes	
$age_{i,t}$	Age of investor i at t
$gender_i$	Gender of investor i
$country_i$	Country of residency of investor i
$pfsize_{i,t}$	Number of unique start-ups investor i holds in her portfolio at t
$exp_{i,t}$	Number of weeks that investor i has been registered on *Companisto* at t
$type_{i,t}$	Binary coded variable indicating the investor type. Depending on the respective specification a value of 1 (0) indicates (a) that the investor is registered as "company" ("private") as of January 2017; (b) that a "private" investor has invested in equal to or more (less) than five distinct start-ups or (c) that a "private" investor has, on average, invested equal to or more (less) than 500 Euro per start-up-investment
Investment Attributes	
$amount_{i,j}$	Amount that investor i invests in firm j in t (divided by 1,000)

A1 Variable Definitions (*continued*)

Variable	Definition
Issuance Attributes	
$discl_j$	Total amount of narrative disclosures that firm *j* provides on *Companisto* at funding-start in "Overview"-, "Team"- and "Financial Data"-Section, measured as total number of words
$\#figures_j$	Number of figures that are included in disclosures related to issuance *j* on *Companisto* at funding-start
$\#tables_j$	Number of tables that are included in disclosures related to issuance *j* on *Companisto* at funding-start
vid_length_j	Duration of the pitch video; measured in minutes
$patent_j$	Binary coded variable with one indicating that issuing firm *j* holds at least one patent at funding start; zero otherwise
$debt_j$	Binary coded variable with one (zero) indicating that issuance *j* represents the sale of debt (equity-like) securities
$prior\_VC_j$	Binary coded variable with one indicating that at least one professional risk capital provider (*i.e.*, Business Angel and/or Venture Capital Company) is invested in issuing firm *j* prior to (*i.e.*, at the beginning of) the crowdinvesting campaign; zero otherwise
$years\_i\_b_j$	Years start-up *j* has been operating under current legal form at funding-start
add_tabs_j	Binary coded variable with one (zero) indicating that issuance *j* includes additional information sections (*e.g.*, an additional video-section)
$\#staff_j$	Number of staff firm *j* employs at the funding-start
Funding Dynamics	
$\%funded_{j,t}$	Ratio of cumulative investments in issuing firm *j* at *t* over total funding amount
$\#investors_{j,t}$	Cumulative number of investments (~investors that invested) during the crowdinvesting campaign in firm *j* at *t*
$prof\_invested_{j,t}$	Binary coded variable with 1 indicating that at least one investment by a firm whose name indicates a professional risk capital provider and whose investments amounts to at least 1,000 Euro is displayed in the "Prior Investments"-Section of firm *j* at *t*; 0 otherwise
$\#updates_{j,t}$	Total number of updates provided by firm *j* at *t*

A2 Varying type cut-offs: Information Acquisition and Investor Attributes

Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
type (male)	-0.006	0.104***	0.059***	0.037**	0.155	2.441	1.396	1.400
	(-1.394)	(5.144)	(3.372)	(2.126)	(0.184)	(1.292)	(1.334)	(0.805)
*type (1 if **pfsize** ≥ **3**)*	-0.005	-0.020	-0.043***	-0.033***	-4.319***	0.109	-0.502	1.061
	(-0.960)	(-1.354)	(-4.517)	(-3.059)	(-6.620)	(0.099)	(-0.731)	(1.032)
*type (1 if **Øamount** ≥ **1,000**)*	-0.000	0.087***	0.033**	0.061***	0.068	-0.518	1.442	-0.777
	(-0.088)	(4.704)	(2.441)	(3.831)	(0.041)	(-0.284)	(1.098)	(-0.425)
age	0.000	-0.007***	-0.002***	-0.004***	-0.041	-0.037	-0.098***	0.121*
	(0.512)	(-20.931)	(-4.973)	(-9.152)	(-1.628)	(-1.234)	(-3.613)	(1.936)
pfsize	0.000	-0.001	-0.002***	0.001**	0.034	0.032	-0.022	0.118*
	(1.567)	(-1.470)	(-3.682)	(2.127)	(0.916)	(0.612)	(-0.519)	(1.866)
exp	-0.000	-0.000**	-0.000	-0.000**	-0.001	-0.022**	0.002	-0.027**
	(-1.278)	(-2.192)	(-1.504)	(-2.180)	(-0.105)	(-2.428)	(0.424)	(-2.206)
updates	-0.001	0.011*	0.005	0.016***	0.811***	0.765***	-0.161	0.910***
	(-0.322)	(2.028)	(1.359)	(3.026)	(5.479)	(2.928)	(-0.750)	(3.234)
amount	-0.001	0.028***	0.032***	0.042***	2.675***	1.676	0.154	1.142
	(-0.529)	(5.817)	(7.257)	(8.754)	(3.299)	(1.585)	(0.439)	(1.401)
%funded	0.015	-0.282***	-0.162***	-0.261***	-11.290***	-10.539***	1.221	-8.296
	(0.783)	(-4.815)	(-3.522)	(-6.199)	(-4.838)	(-3.985)	(0.427)	(-1.473)
prof_invested	0.001	-0.055**	-0.025	-0.049*	-0.167	2.540*	-2.736	3.756
	(0.093)	(-2.363)	(-1.192)	(-2.005)	(-0.160)	(1.874)	(-1.704)	(1.668)
#investors	-0.000	-0.000	-0.000	-0.000***	-0.010***	-0.011**	-0.000	-0.017**
	(-0.691)	(-1.333)	(-1.405)	(-3.675)	(-3.707)	(-2.428)	(-0.020)	(-2.247)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuance & Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	39.50%	9.38%	4.82%	8.77%	4.11%	2.03%	1.35%	3.94%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

A3 Pooled Sample: Information Acquisition and Funding Dynamics

Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
%funded	0.005	-0.101*	-0.076*	-0.024	-2.738	-0.601	3.049	3.742
	(0.378)	(-1.835)	(-1.908)	(-0.433)	(-0.960)	(-0.117)	(0.520)	(0.584)
#investors	-0.000	-0.000	-0.000	-0.000**	-0.005	-0.010	-0.001	-0.029***
	(-0.574)	(-1.490)	(-0.514)	(-2.198)	(-1.337)	(-1.630)	(-0.093)	(-3.426)
prof_invested	-0.001	-0.019	0.001	-0.020	0.127	3.194	-3.132	3.833
	(-0.078)	(-1.234)	(0.039)	(-1.043)	(0.106)	(1.590)	(-1.568)	(1.605)
#updates	-0.001	-0.000	0.001	0.002	0.416*	0.753	-0.685**	1.509***
	(-0.406)	(-0.032)	(0.154)	(0.580)	(1.750)	(1.273)	(-2.218)	(2.952)
pfsize	0.002**	-0.001	-0.001	0.002	0.240	-0.029	0.264	0.339
	(2.171)	(-0.460)	(-0.521)	(0.693)	(1.186)	(-0.098)	(0.885)	(0.948)
exp	0.001	-0.000	-0.002	-0.002	-0.278	-0.594	0.167	-1.027*
	(0.550)	(-0.042)	(-0.715)	(-0.889)	(-1.416)	(-1.540)	(0.812)	(-1.726)
amount	-0.001	0.018**	0.036***	0.024***	2.887**	4.522*	1.012	-0.329
	(-0.250)	(2.708)	(5.621)	(3.050)	(2.269)	(1.984)	(0.663)	(-0.175)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor & Issuance FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	48.80%	53.00%	33.90%	55.30%	30.50%	15.20%	-2.20%	20.20%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

A4 Pooled Sample: Information Acquisition and Firm Attributes

Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
prior_VC	-0.039	0.012	0.012	0.020	-1.384	0.483	-0.007	6.027***
	(-1.329)	(0.803)	(0.606)	(1.343)	(-1.108)	(0.251)	(-0.004)	(3.166)
patent	-0.055*	0.001	0.010	-0.002	-0.433	-3.360**	0.274	2.720
	(-1.731)	(0.076)	(0.834)	(-0.228)	(-0.644)	(-2.520)	(0.233)	(1.632)
debt	-0.283***	-0.080***	0.008	-0.041	-2.653	-3.214	-0.722	-3.703
	(-3.056)	(-2.892)	(0.290)	(-1.203)	(-1.107)	(-0.833)	(-0.254)	(-1.005)
years_i_b	0.001	0.000	-0.001	0.001	-0.096	0.184	-0.031	-0.102
	(0.300)	(0.397)	(-1.097)	(1.392)	(-0.843)	(1.193)	(-0.226)	(-0.840)
#staff	0.007***	0.001**	-0.001	-0.000	0.121***	0.005	-0.054	0.109
	(2.834)	(2.382)	(-1.416)	(-0.291)	(2.896)	(0.054)	(-0.755)	(1.378)
add_tabs	0.078*	0.019	-0.036	-0.018	0.857	-0.554	-2.015	0.145
	(1.741)	(1.231)	(-1.709)	(-0.883)	(0.670)	(-0.275)	(-1.178)	(0.050)
discl	-0.000	-0.000*	0.000	-0.000	-0.002	-0.003	0.000	-0.015*
	(-1.189)	(-1.892)	(0.305)	(-0.657)	(-1.007)	(-0.507)	(0.064)	(-1.873)
#tables	-0.108**	0.011*	0.003	0.015**	-0.000	-0.000	-0.001*	-0.001
	(-2.805)	(1.877)	(0.652)	(2.373)	(-0.935)	(-0.647)	(-1.806)	(-0.526)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	35.10%	52.90%	33.80%	55.20%	30.30%	15.10%	-2.82%	20.00%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

A4 Pooled Sample: Information Acquisition and Firm Attributes (*continued*)

Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
#figures	0.006**	0.000	-0.001	-0.002***	0.011	-0.037	0.209*	-0.418***
	(2.245)	(0.330)	(-1.168)	(-3.060)	(0.176)	(-0.421)	(1.960)	(-3.982)
vid_length	-0.000	0.000**	0.000	-0.000	0.004	0.005	0.012***	0.000
	(-0.855)	(2.319)	(0.140)	(-0.613)	(1.238)	(1.179)	(3.127)	(0.007)
#updates	-0.004	0.001	0.002	0.001	0.048	0.058	-0.225	0.372
	(-1.188)	(0.321)	(0.760)	(0.443)	(0.267)	(0.151)	(-0.896)	(0.840)
%funded	0.046	-0.109***	-0.081***	-0.059	-4.781*	-2.015	-0.251	-10.400*
	(1.304)	(-3.063)	(-3.507)	(-1.432)	(-2.056)	(-0.540)	(-0.052)	(-2.023)
#investors	-0.000	-0.000	-0.000	-0.000	-0.002	-0.003	0.000	-0.015*
	(-1.386)	(-1.458)	(-0.629)	(-1.358)	(-1.007)	(-0.507)	(0.064)	(-1.873)
prof_invested	-0.042**	-0.002	0.009	-0.003	-0.659	1.474	-0.964	2.866
	(-2.367)	(-0.148)	(0.884)	(-0.206)	(-1.021)	(0.925)	(-0.665)	(1.627)
pfsize	-0.000	-0.000	-0.002	0.002	0.241	0.059	0.063	0.404
	(-0.360)	(-0.244)	(-0.897)	(0.719)	(1.208)	(0.216)	(0.200)	(1.177)
exp	0.008**	-0.003*	-0.003**	-0.003	0.027	-0.229	-0.072	0.170
	(2.210)	(-1.911)	(-2.238)	(-1.640)	(0.188)	(-1.312)	(-0.355)	(0.739)
amount	-0.002	0.018**	0.036***	0.025***	2.825**	4.570*	1.088	-0.129
	(-0.704)	(2.721)	(5.677)	(3.167)	(2.239)	(2.016)	(0.692)	(-0.072)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	35.10%	52.90%	33.80%	55.20%	30.30%	15.10%	-2.82%	20.00%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.

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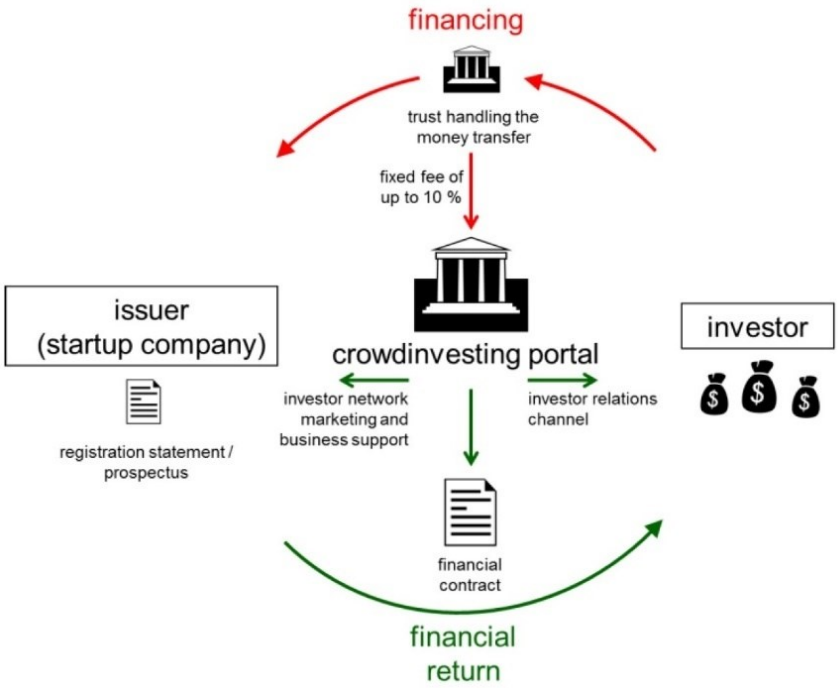
FIGURE 1

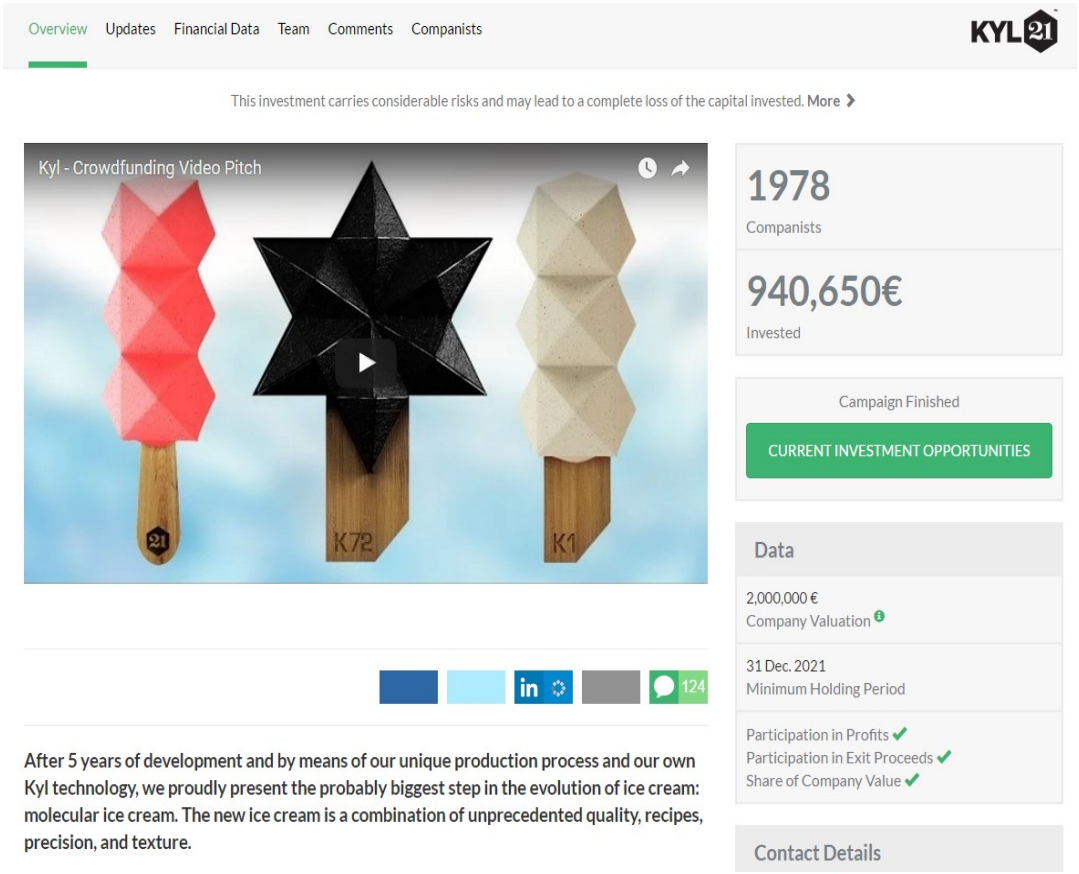
Crowdinvesting – Market Structure



Source: Hornuf and Schwienbacher (2016a).

FIGURE 2

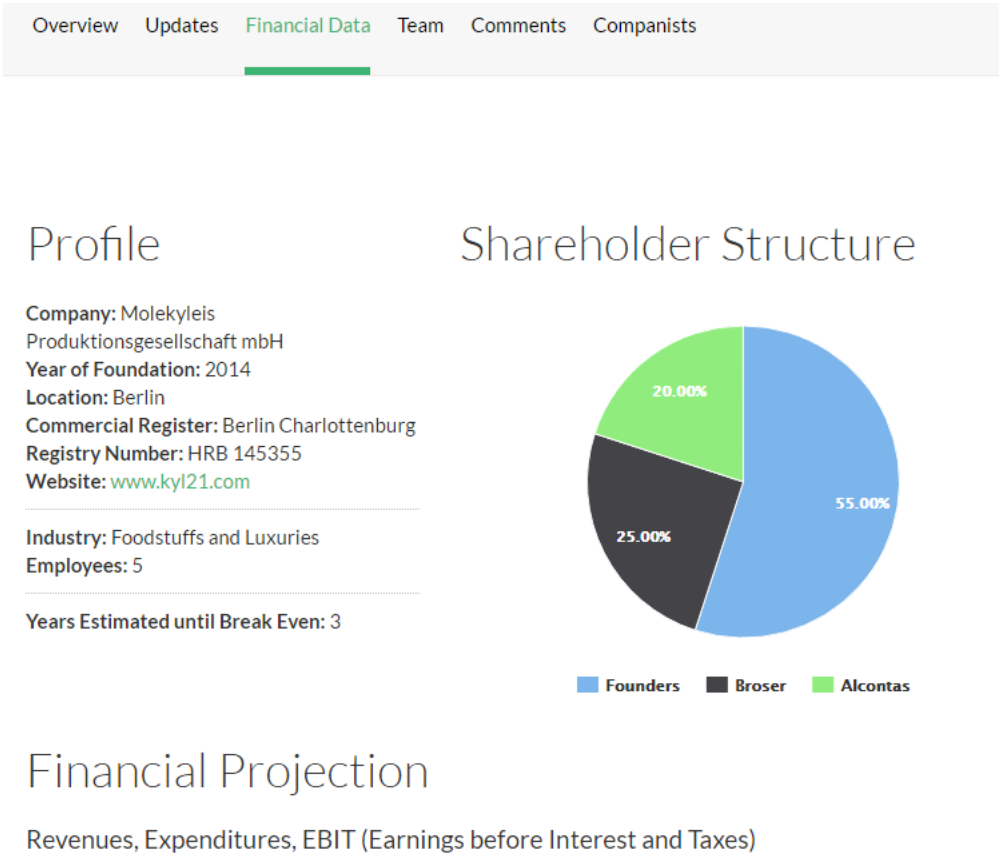
Firms' Disclosures on Companisto



Notes: This figure shows a screenshot taken on *Companisto's* webpage. It illustrates firms' information environment on *Companisto*. The screenshot gives an example of the "Overview"-Section of each listing which is typically the landing page if investors access a crowdinvesting. In the different tabs (*i.e.*, sections) of each listing (*e.g.*, "Overview", "Team", etc.) potential investors are provided with different types of information (*e.g.*, information on the business model, key financials, etc.).

FIGURE 3

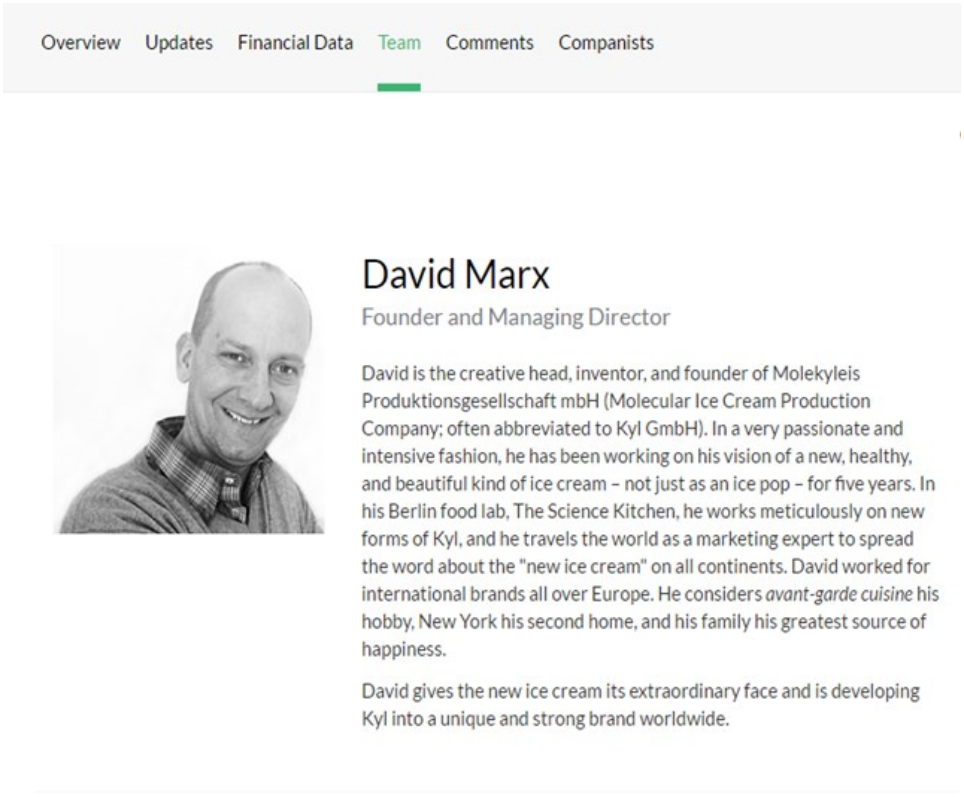
Firms' Disclosures on Companisto: Financials



Notes: This figure shows a screenshot taken on *Companisto's* webpage. It gives an example of the information provided in the "Financial Data"-Section of each listing. This section includes some general information on the legal form and structure of the firm along with forward-looking financial information.

FIGURE 4

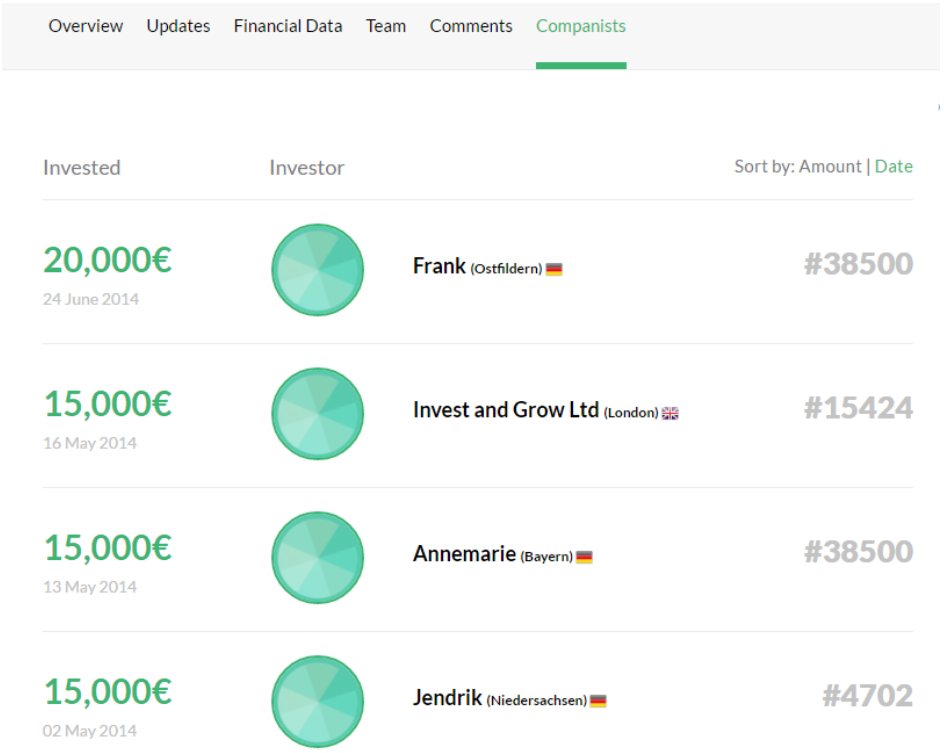
Firms' Disclosures on Companisto: Team Attributes



Notes: This figure shows a screenshot taken on *Companisto's* webpage. It gives an example of the information provided in the "Team"-Section of each listing. Here, the profiles and social media links of the managing team (including the founders) can be found.

FIGURE 5

Firms' Disclosures on Companisto: Investment History



Notes: This figure shows a screenshot taken on *Companisto's* webpage. It gives an example of the information provided in the "Companists" (*i.e.*, the "Prior Investments")-Section of each listing. In this section, investors can observe the full investment history of the respective crowdinvesting, including investor names and the amounts and dates of their respective investments.

TABLE 1

Sample Selection

Starting point: Data on 68,450 *investors, 77 issuances,* 63,436 *investments,* 2,421,417 *page views*

	investors	***issuances***	***investments***	***page views***
User-level data (*i.e.*, registration and investing information) from *Companisto* *(period: **Jun 2012** to Jan 2017)*	68,450	77	63,436	
User-level Google Analytics data on investors' information acquisition on *Companisto* *(period: **Oct 2015** to Jan 2017)*				2,421,417
less page views that are not issuance-related				*-1,543,959*
Merged sample	**28,505**	**33**	**20,326**	**877,458**
less page views related to issuance information other than the following sections: "Overview", "Team", "Financial Data", "Comments"	*-4,458*		*-4,667*	*-429,126*
less observations with missing investor information	*-125*		*-6*	*-5,687*
less investments by users who invested in less than two unique start-ups since registering on *Companisto*	*-3,411*		*-2,107*	*-50,522*
less page views without (after) an investment in the respective firm	*-16,717*	*-2*	*0*	*-247,380*
less investments related to issuances, that represent the second funding rounds of firms on *Companisto*	*-73*	*-7*	*-251*	*-2,363*
less investments by investors who live or accessed the contents on *Companisto* in countries other than Austria, Germany and Switzerland	*-593*		*-3,151*	*-23,917*
Final Sample	**3,128**	**24**	**10,144**	**118,463**

Notes: This table illustrates the specific steps taken in the selection of the final sample.

TABLE 2

Investor Attributes

				Investor properties			(Share of) Investor groups		
Age	Investors	Investments	*male*	*amount*	*pfsize (# of start-ups)*	*exp (in weeks)*	*Øamount* ≥ € 500	*pfsize* ≥ 5	*exp* ≥ 1 year
≤ 19	55	267	0.98	106.46	4.47	47.31	7.27%	23.64%	34.55%
20 to 29	912	3,182	0.94	300.97	7.06	78.59	18.75%	45.18%	57.68%
30 to 39	1,103	3,448	0.94	600.89	7.95	96.74	32.73%	50.86%	69.17%
40 to 49	616	2,011	0.93	866.64	9.15	105.10	43.18%	53.41%	75.00%
50 to 59	335	952	0.87	1,219.05	7.83	97.96	55.82%	50.15%	74.03%
≥ 60	107	284	0.89	1,446.20	6.79	82.53	70.09%	42.06%	68.22%
Total	**3,128**	**10,144**	**0.93**	**652.20**	**7.82**	**91.87**	**34.02%**	**48.85%**	**66.85%**

Notes: This table provides descriptive statistics for the attributes of the investors registered on *Companisto* as of January 2017. Specifically, it shows investor attributes by age group and investor type.

TABLE 3

Summary Statistics and Correlations – Investor Level

Panel A: Summary Statistics – Investor Level

Variable	Obs.	Mean	SD	Min	P25	P50	P75	Max
age	3,128	36.98	11.21	18.21	28.36	34.79	44.46	89.85
male	3,128	0.93	0.26	0.00	1.00	1.00	1.00	1.00
pfsize	3,128	7.82	9.40	2.00	3.00	4.00	9.00	77.00
exp	3,128	91.87	63.96	0.00	44.14	69.86	136.29	242.57
Øamount	3,128	652.20	1,236.38	5.00	71.37	244.75	700.00	22,500

Panel B: Correlations – Investor Level

N = 3,128	(1)	(2)	(3)	(4)	(5)
(1) *age*		**-0.076**	**0.101**	**0.171**	**0.348**
(2) *male*	**-0.084**		**0.050**	-0.010	0.011
(3) *pfsize*	**0.052**	**0.043**		**0.509**	**-0.113**
(5) *exp*	**0.115**	-0.002	**0.477**		-0.022
(6) *Øamount*	**0.267**	-0.002	**-0.112**	**-0.042**	

Notes: This table provides descriptive statistics for the attributes of the investors registered on *Companisto* as of January 2017. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. Pearson's correlation coefficients are shown in the lower triangle while Spearman's rank correlations appear above the diagonal. See Appendix A1 for the variable definitions.

TABLE 4

Summary Statistics and Correlations – Firm Level

Panel A: Summary Statistics – Firm Level

Variable	Obs.	Mean	SD	Min	P25	P50	P75	Max
debt	24	0.08	0.28	0.00	0.00	0.00	0.00	1.00
years_i_b	24	4.58	5.99	0.00	2.00	3.00	4.00	28.00
#staff	24	13.54	11.95	1.00	6.00	10.50	16.50	52.00
add_tabs	24	0.21	0.42	0.00	0.00	0.00	0.00	1.00
prior_VC	24	0.50	0.51	0.00	0.00	0.50	1.00	1.00
patent	24	0.38	0.50	0.00	0.00	0.00	1.00	1.00
discl	24	4,870.71	1,255.13	2,786.00	3,845.50	4,680.50	5,808.00	7,244.00
#tables	24	2.83	1.55	0.00	2.00	2.00	4.00	7.00
#figures	24	13.04	7.16	3.00	6.50	12.50	16.00	31.00
vid_length	24	273.38	92.73	106.00	216.00	275.00	340.00	500.00
#updates	24	8.46	4.66	1.00	6.00	8.00	10.00	18.00

TABLE 4 *(continued)*

Summary Statistics and Correlations – Firm Level

Panel B: Correlations – Firm Level

N = 24	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) *debt*		**0.464**	**0.416**	-0.155	-0.302	0.078	-0.153	-0.187	0.076	0.153	-0.055
(2) *years_i_b*	**0.767**		**0.787**	-0.241	-0.202	0.095	0.012	0.063	-0.010	0.226	0.194
(3) *#staff*	**0.644**	**0.568**		-0.142	0.054	-0.019	-0.012	0.018	0.160	0.041	0.283
(4) *add_tabs*	-0.155	-0.208	-0.112		0.103	-0.185	**-0.422**	-0.318	-0.022	0.171	-0.239
(5) *prior_VC*	-0.302	-0.327	-0.061	0.103		-0.258	0.024	-0.123	0.151	-0.235	0.255
(6) *patent*	0.078	0.290	-0.021	-0.185	-0.258		0.056	0.147	0.081	-0.062	0.063
(7) *discl*	-0.149	-0.122	0.030	**-0.443**	0.037	0.035		**0.488**	**0.462**	0.115	0.253
(8) *#tables*	-0.166	-0.129	-0.075	**-0.349**	-0.165	0.198	**0.396**		0.290	-0.049	-0.077
(9) *#figures*	0.020	-0.044	0.178	-0.047	0.268	0.069	**0.459**	0.220		0.142	0.225
(10) *vid_length*	0.102	0.121	0.058	0.130	-0.246	0.045	0.061	-0.053	0.098		0.014
(11) *#updates*	-0.063	0.160	0.261	-0.254	0.265	0.035	0.215	-0.031	0.300	-0.009	

Notes: This table presents the descriptive statistics for the issuance (*i.e.*, firm) attributes. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. Pearson's correlation coefficients are shown in the lower triangle while Spearman's rank correlations appear above the diagonal. See Appendix A1 for the variable definitions.

TABLE 5

Summary Statistics and Correlations – Investment Level

Panel A: Summary Statistics – Investment Level

Variable	Obs.	Mean	SD	Min	P25	P50	P75	Max
pv_overview	10,144	0.97	0.18	0.00	1.00	1.00	1.00	1.00
pv_financials	10,144	0.50	0.50	0.00	0.00	0.00	1.00	1.00
pv_team	10,144	0.21	0.41	0.00	0.00	0.00	0.00	1.00
pv_forum	10,144	0.36	0.48	0.00	0.00	0.00	1.00	1.00
age	10,144	36.20	11.01	18.04	27.64	34.43	43.41	89.33
male	10,144	0.95	0.23	0.00	1.00	1.00	1.00	1.00
pfsize	10,144	9.44	12.73	0.00	1.00	4.00	12.00	74.00
exp	10,144	60.75	63.76	0.00	5.29	37.71	99.29	240.86
debt	10,144	0.09	0.29	0.00	0.00	0.00	0.00	1.00
years_i_b	10,144	5.62	6.45	0.00	2.00	3.00	6.00	28.00
#staff	10,144	16.63	12.09	1.00	8.00	12.00	26.00	52.00
add_tabs	10,144	0.24	0.43	0.00	0.00	0.00	0.00	1.00
prior_VC	10,144	0.60	0.49	0.00	0.00	1.00	1.00	1.00
patent	10,144	0.36	0.48	0.00	0.00	0.00	1.00	1.00
discl	10,144	4,776.41	1,263.50	2,786.00	3,796.00	4,534.00	5,945.00	7,244.00
#tables	10,144	2.59	1.40	0.00	2.00	2.00	4.00	7.00
#figures	10,144	13.30	7.48	3.00	6.00	12.00	16.00	31.00
vid_length	10,144	274.73	85.64	106.00	217.00	279.00	347.00	500.00
#updates	10,144	2.97	4.23	0.00	0.00	1.00	5.00	19.00
prof_invested	10,144	0.51	0.50	0.00	0.00	1.00	1.00	1.00
amount	10,144	0.49	1.06	0.01	0.03	0.10	0.50	10.00
%funded	10,144	0.38	0.31	0.00	0.08	0.33	0.66	1.00
#investors	10,144	332.56	327.51	0.00	45.00	249.00	518.00	1,485.00

TABLE 5 *(continued)*

Summary Statistics and Correlations – Investment Level

Panel B: Correlations – Investment Level

N = 10,114	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(1) *pv_overview*		**-0.11**	**-0.04**	**-0.06**	**0.02**	-0.01	0.00	0.00	**0.04**	**0.14**	**0.14**	**0.05**	**0.06**	**-0.12**	**0.02**	**-0.11**	**0.08**	**0.09**	**0.01**	**0.03**	0.00	0.00	0.04
(2) *pv_financials*	**-0.11**		**0.44**	**0.49**	**-0.12**	**0.07**	-0.01	**-0.03**	**-0.08**	**-0.03**	0.00	**0.03**	0.02	0.01	**0.02**	**0.04**	0.01	**0.02**	**-0.11**	**-0.07**	**0.13**	**-0.14**	**-0.13**
(3) *pv_team*	**-0.04**	**0.44**		**0.47**	**-0.02**	**0.04**	**-0.05**	**-0.06**	**-0.04**	**-0.02**	-0.01	**0.02**	-0.01	0.01	-0.01	**-0.02**	**-0.02**	-0.01	**-0.10**	**-0.05**	**0.15**	**-0.12**	**-0.11**
(4) *pv_forum*	**-0.06**	**0.49**	**0.47**		**-0.05**	**0.04**	**0.04**	**0.02**	**-0.05**	0.00	0.00	-0.01	-0.01	**0.02**	**0.02**	**0.05**	**-0.02**	0.00	**-0.14**	**-0.11**	**0.14**	**-0.18**	**-0.17**
(5) *age*	**0.02**	**-0.12**	**-0.02**	**-0.05**		**-0.06**	**0.12**	**0.14**	**0.04**	**0.03**	**0.03**	-0.01	-0.01	0.01	-0.01	0.01	0.02	0.00	**-0.05**	**-0.03**	**0.29**	**-0.06**	**-0.06**
(6) *male*	-0.01	**0.07**	**0.04**	**0.04**	**-0.07**		**0.04**	**0.02**	**-0.04**	0.00	0.00	-0.01	**0.01**	0.00	0.01	0.02	0.00	0.00	**-0.03**	**-0.04**	**-0.01**	**-0.03**	**-0.03**
(7) *pfsize*	0.00	**-0.03**	**-0.06**	**0.04**	**0.08**	**0.03**		**0.72**	0.00	**-0.02**	**-0.05**	**-0.07**	**-0.03**	0.01	**0.09**	**0.10**	**0.02**	**0.02**	**-0.37**	**-0.25**	**-0.26**	**-0.38**	**-0.40**
(8) *exp*	0.01	**-0.05**	**-0.07**	-0.01	**0.09**	**0.02**	**0.65**		0.02	**0.03**	-0.01	**-0.10**	**0.03**	0.01	**0.08**	**0.11**	**0.03**	0.01	**-0.19**	**-0.14**	**-0.12**	**-0.21**	**-0.19**
(9) *amount*	**0.04**	**-0.08**	**-0.04**	**-0.05**	**0.05**	**-0.04**	-0.01	0.01		**0.47**	**0.36**	**-0.18**	**-0.39**	**0.13**	**-0.20**	**-0.14**	**0.05**	**0.13**	**-0.05**	**0.19**	**0.08**	**0.03**	**-0.02**
(10) *debt*	**0.07**	**-0.05**	**-0.02**	**-0.02**	**0.04**	**-0.01**	**-0.03**	**0.02**	**0.73**		**0.69**	**-0.44**	**-0.41**	**0.25**	**0.09**	**0.26**	**0.07**	**0.16**	0.00	**0.02**	**0.11**	**-0.02**	**0.10**
(11) *years_i_b*	**0.10**	-0.01	-0.01	**-0.02**	**0.04**	**-0.02**	**-0.07**	**-0.03**	**0.54**	**0.51**		**-0.25**	**-0.10**	**0.18**	**0.20**	**0.30**	**0.46**	0.01	**0.08**	**0.23**	**0.11**	0.00	0.14
(12) *#staff*	**0.05**	**0.03**	**0.02**	-0.01	-0.01	-0.01	**-0.05**	**-0.10**	**-0.18**	**-0.30**	**-0.19**		**0.15**	**-0.09**	**-0.44**	**-0.38**	**-0.07**	**0.09**	**-0.05**	**0.05**	0.01	**0.04**	**-0.01**
(13) *add_tabs*	**0.06**	0.02	-0.01	-0.01	-0.01	**0.01**	**-0.03**	**0.03**	**-0.39**	**-0.50**	**-0.16**	**0.15**		**-0.40**	**-0.02**	**-0.06**	**0.18**	**-0.18**	**0.11**	**-0.04**	-0.01	**0.07**	**0.13**
(14) *prior_VC*	**-0.12**	0.01	0.01	**0.02**	0.01	0.00	0.00	0.01	**0.13**	**0.42**	**0.12**	**-0.09**	**-0.40**		0.00	**0.05**	**0.04**	**-0.19**	**0.03**	**0.08**	**0.04**	**0.04**	**0.02**
(15) *patent*	**0.04**	0.01	**-0.02**	**0.02**	-0.01	0.01	**0.08**	**0.08**	**-0.15**	**-0.05**	**0.18**	**-0.49**	**-0.06**	0.00		**0.65**	**0.49**	**0.17**	0.01	0.00	**-0.04**	**-0.04**	**-0.08**
(16) *discl*	**-0.20**	**0.05**	-0.01	**0.05**	0.00	0.02	**0.08**	**0.10**	**-0.13**	**-0.06**	**0.12**	**-0.42**	**-0.09**	**0.08**	**0.60**		**0.39**	**0.09**	**-0.06**	**-0.25**	**-0.02**	**-0.11**	**-0.11**
(17) *#tables*	**0.07**	0.01	**-0.02**	-0.01	0.01	0.00	0.01	**0.04**	0.00	**-0.03**	**0.29**	**-0.08**	**0.25**	**0.05**	**0.45**	**0.34**		**0.10**	**0.11**	**0.20**	0.00	**0.02**	**0.04**
(18) *#figures*	**0.08**	**0.02**	-0.01	0.01	0.00	0.01	**0.02**	0.01	**0.11**	**0.13**	**0.09**	**0.04**	**-0.20**	**-0.11**	**0.17**	**0.07**	**0.04**		**-0.10**	**0.08**	**0.05**	0.01	-0.04
(19) *vid_length*	0.00	**-0.06**	**-0.07**	**-0.10**	**-0.04**	**-0.02**	**-0.23**	**-0.08**	**-0.08**	0.01	**0.05**	**-0.12**	**0.12**	**0.02**	**0.04**	**-0.01**	**0.17**	**-0.12**		**0.55**	**0.02**	**0.84**	**0.89**
(20) *#updates*	**0.03**	**-0.07**	**-0.05**	**-0.11**	**-0.03**	**-0.04**	**-0.20**	**-0.10**	**0.19**	**0.21**	**0.30**	**0.05**	**-0.04**	**0.08**	**-0.01**	**-0.25**	**0.19**	0.00	**0.47**		**0.05**	**0.56**	**0.61**
(21) *prof_invested*	0.01	**0.08**	**0.11**	**0.11**	**0.24**	0.00	**-0.16**	**-0.08**	**0.08**	**0.10**	**0.09**	0.00	**-0.02**	**0.01**	**-0.04**	**-0.02**	0.00	**0.04**	**0.02**	**0.03**		**-0.02**	**0.03**
(22) *%funded*	0.00	**-0.13**	**-0.11**	**-0.17**	**-0.05**	**-0.03**	**-0.27**	**-0.12**	**0.03**	-0.01	**0.02**	**0.08**	**0.08**	**0.03**	**-0.07**	**-0.12**	0.01	0.01	**0.74**	**0.53**	-0.02		0.89
(23) *#investors*	0.04	**-0.09**	**-0.09**	**-0.14**	**-0.04**	**-0.02**	**-0.28**	**-0.10**	**-0.05**	**0.07**	**0.12**	0.01	**0.16**	0.00	**-0.11**	**-0.13**	**0.04**	**-0.07**	**0.86**	**0.55**	**0.02**	**0.81**	

Notes: This table presents the descriptive statistics for the investment-level variables. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, Pearson's correlation coefficients are shown in the lower triangle while Spearman's rank correlations appear above the diagonal. Statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. See Appendix A1 for the variable definitions.

TABLE 6

Summary Statistics of Page View by Content and Investor Type

mean(page_view)					
Content Type / Investor Type	Obs.	Overview	Financial Data	Team	Forum
Full sample	10,144	0.968	0.497	0.208	0.358
(a) Female	558	0.973	0.357	0.142	0.289
(b) Male	9,586	0.968	0.505	0.212	0.362
Diff (a) - (b)		***0.005***	***-0.149****	***-0.071****	***-0.074****
(c) *pfsize* < 5	5,193	0.967	0.500	0.224	0.335
(d) *pfsize* ≥ 5	4,951	0.969	0.494	0.191	0.383
Diff (c) - (d)		***-0.002***	***0.005***	***0.033****	***-0.047****
(e) *Øamount* < 500	7,244	0.968	0.464	0.178	0.320
(f) *Øamount* ≥ 500	2,900	0.968	0.579	0.285	0.454
Diff (e) - (f)		***0.000***	***-0.115****	***-0.107****	***-0.134****

Notes: This table provides descriptive statistics for investors' information acquisition related to the 10,144 investments in the full sample. Based on investor-level Google Analytics data, it shows the distribution of page views (*page_view*) by content and investor type.

TABLE 7

Summary Statistics of Pagetime by Content and Investor Type

	content_pt											
Content Type	Overview			Financial Data			Team			Forum		
Investor Type	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Full sample	6,441	11.32	21.67	3,627	11.19	23.34	1,892	4.35	13.65	2,231	15.81	26.49
(a) Female	399	10.80	20.47	147	8.23	16.77	71	2.66	7.04	124	13.76	18.47
(b) Male	6,042	11.35	21.75	3,480	11.31	23.57	1,821	4.42	13.84	2,107	15.93	26.89
Diff (a) - (b)		***-0.55***			***-3.08*****			***-1.76*****			***-2.17***	
(c) *pfsize* < 5	3,231	12.04	21.63	1,869	10.49	20.95	1,039	4.76	14.91	1,146	14.27	25.42
(d) *pfsize* ≥ 5	3,210	10.59	21.69	1,758	11.93	25.63	853	3.86	11.92	1,085	17.43	27.50
Diff (c) - (d)		***1.45*****			***-1.45*****			***0.90****			***-3.16******	
(e) *Øamount* < 500	4,857	9.86	19.93	2,461	10.22	22.05	1,163	3.89	13.43	1,480	14.16	23.05
(f) *Øamount* ≥ 500	1,584	15.79	25.79	1,166	13.23	25.75	729	5.09	13.96	751	19.04	31.99
Diff (e) - (f)		***-5.93******			***-3.00******			***-1.20*****			***-4.88******	

Notes: This table provides descriptive statistics for investors' information acquisition. Based on investor-level Google Analytics data, it shows the distribution of pagetime across content types and investor groups. Specifically, the distribution of *content_pt* which aggregates the time for which investors open a webpage on the investor-issuance-content type-level is presented.

TABLE 8

Information Acquisition and Investor Attributes

Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
type (male)	-0.006	0.104***	0.057***	0.035*	0.100	2.467	1.511	1.868
	(-1.407)	(5.206)	(3.286)	(2.040)	(0.134)	(1.321)	(1.454)	(1.075)
type (1 if pfsize ≥ 5)	-0.000	-0.014	-0.024**	0.003	-3.198***	1.529	-1.641	-1.085
	(-0.128)	(-1.147)	(-2.775)	(0.229)	(-4.794)	(1.410)	(-1.512)	(-0.942)
type (1 if Øamount ≥ 500)	-0.001	0.116***	0.072***	0.117***	3.850***	1.616	1.242*	5.379***
	(-0.209)	(7.724)	(5.900)	(9.569)	(3.669)	(1.198)	(1.741)	(3.066)
age	0.000	-0.007***	-0.002***	-0.005***	-0.067**	-0.053*	-0.101***	0.081
	(0.489)	(-22.932)	(-6.460)	(-10.073)	(-2.725)	(-1.768)	(-3.700)	(1.359)
pfsize	0.000	-0.001	-0.001***	0.001**	0.056	0.017	0.012	0.174**
	(1.116)	(-0.931)	(-3.068)	(2.249)	(1.436)	(0.295)	(0.347)	(2.709)
exp	-0.000	-0.000**	-0.000*	-0.000**	-0.003	-0.024***	0.004	-0.020*
	(-1.710)	(-2.182)	(-1.955)	(-2.638)	(-0.415)	(-3.041)	(0.613)	(-1.755)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuance & Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	39.50%	9.87%	5.09%	9.38%	4.21%	2.14%	1.54%	4.57%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 (A2) for the variable definitions [the complete regression output (including controls) for the pooled sample].

TABLE 9

Information Acquisition, Funding Dynamics and Crowdinvesting Experience

investor *type* = 1 (0) if *pfsize* ≥ (<) 5								
Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
%funded	0.004	-0.059	-0.065	0.030	2.331	1.613	9.155	0.125
	(0.251)	(-0.930)	(-1.231)	(0.429)	(0.646)	(0.291)	(1.064)	(0.019)
type x %funded	0.002	-0.066*	-0.007	-0.103**	-9.236**	-4.075	-12.299	6.875
	(0.076)	(-1.740)	(-0.127)	(-2.292)	(-2.646)	(-0.836)	(-1.654)	(1.072)
#investors	-0.000	-0.000	-0.000	-0.000	-0.006	-0.009	-0.002	-0.029***
	(-0.495)	(-1.258)	(-0.108)	(-1.693)	(-1.571)	(-1.396)	(-0.306)	(-2.865)
type x #investors	-0.000	-0.000	-0.000	-0.000	0.003	-0.005	0.004	-0.000
	(-0.158)	(-1.240)	(-0.918)	(-0.829)	(0.863)	(-0.444)	(0.571)	(-0.033)
prof_invested	0.005	-0.003	-0.009	-0.036	0.179	2.804	-2.724	5.926
	(0.862)	(-0.188)	(-0.662)	(-1.600)	(0.125)	(1.397)	(-0.909)	(1.670)
type x prof_invested	-0.010	-0.023	0.020	0.032*	0.052	0.828	-0.516	-3.591
	(-1.037)	(-1.476)	(0.743)	(1.741)	(0.039)	(0.353)	(-0.140)	(-1.041)
#updates	-0.001	-0.003	-0.000	-0.000	0.356	0.562	-0.836***	1.501**
	(-0.668)	(-0.654)	(-0.105)	(-0.159)	(1.284)	(0.772)	(-2.824)	(2.260)
type x #updates	0.001	0.007	0.003	0.006	0.138	0.737	0.264	-0.108
	(0.660)	(1.399)	(0.802)	(1.646)	(0.593)	(1.074)	(0.786)	(-0.132)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor & Issuance FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	48.70%	53.10%	33.80%	55.30%	30.60%	15.20%	-1.88%	20.00%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 (A3) for the variable definitions [the complete regression output (including controls) for the pooled sample].

TABLE 10

Information Acquisition, Funding Dynamics and Average Investment Amounts

investor *type* = 1 (0) if *Øamount* ≥ (<) 500								
Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
%funded	0.004	-0.088	-0.081*	-0.037	-3.500	-1.116	4.281	2.105
	(0.236)	(-1.631)	(-1.884)	(-0.637)	(-1.339)	(-0.228)	(0.603)	(0.363)
type x %funded	0.008	-0.063	0.032	0.061	4.549	-0.304	-3.115	7.921
	(0.428)	(-0.986)	(0.536)	(0.977)	(0.913)	(-0.036)	(-0.522)	(0.711)
#investors	-0.000	-0.000	-0.000	-0.000**	-0.004	-0.007	-0.004	-0.026***
	(-0.713)	(-1.376)	(-0.383)	(-2.341)	(-1.124)	(-0.996)	(-0.632)	(-3.289)
type x #investors	0.000	0.000	-0.000	0.000	-0.005	-0.010	0.010	-0.010
	(0.953)	(0.704)	(-0.476)	(0.980)	(-0.835)	(-1.136)	(1.433)	(-0.884)
prof_invested	-0.001	-0.019	0.010	-0.017	0.387	1.568	-2.969	5.078*
	(-0.169)	(-1.194)	(0.517)	(-0.907)	(0.305)	(0.813)	(-1.230)	(2.004)
type x prof_invested	0.002	0.001	-0.039*	-0.015	-1.308	6.089	-0.450	-5.038
	(0.185)	(0.033)	(-1.968)	(-0.591)	(-0.474)	(1.711)	(-0.181)	(-1.148)
#updates	0.000	-0.000	-0.001	0.004	0.340	0.754	-0.410	1.447***
	(0.289)	(-0.009)	(-0.182)	(1.131)	(1.343)	(1.299)	(-1.318)	(3.296)
type x #updates	-0.004*	-0.000	0.005	-0.007	0.320	0.141	-0.723*	0.256
	(-1.902)	(-0.058)	(1.252)	(-1.608)	(1.061)	(0.319)	(-1.728)	(0.403)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor & Issuance FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	48.80%	53.00%	33.80%	55.20%	30.50%	15.30%	-2.29%	20.10%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 (A3) for the variable definitions [the complete regression output (including controls) for the pooled sample].

TABLE 11

Information Acquisition, Firm Attributes and Crowdinvesting Experience

investor *type* = 1 (0) if *pfsize* ≥ (<) 5								
Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
prior_VC	-0.045	0.022	0.010	0.014	-0.226	-1.267	1.874	5.956**
	(-1.531)	(1.364)	(0.543)	(0.962)	(-0.191)	(-0.483)	(0.861)	(2.091)
type x prior_VC	0.012	-0.021	0.000	0.011	-1.846	2.676	-3.723	-0.050
	(1.391)	(-1.432)	(0.024)	(0.643)	(-1.410)	(1.464)	(-1.533)	(-0.013)
patent	-0.057*	0.012	0.020	-0.003	0.626	-4.548**	0.717	4.018
	(-1.746)	(0.851)	(1.362)	(-0.338)	(0.485)	(-2.602)	(0.490)	(1.707)
type x patent	0.005	-0.021	-0.018	0.003	-1.907	2.124	-1.088	-2.212
	(0.391)	(-1.154)	(-1.145)	(0.229)	(-1.366)	(1.002)	(-0.432)	(-0.624)
debt	-0.280***	-0.096***	-0.017	-0.045	-2.094	-5.367	-0.218	-6.140
	(-3.118)	(-3.179)	(-0.625)	(-1.150)	(-0.916)	(-1.336)	(-0.058)	(-1.453)
type x debt	-0.007	0.032	0.051***	0.007	-0.500	3.528	-1.456	6.017
	(-0.448)	(0.867)	(3.283)	(0.411)	(-0.268)	(0.749)	(-0.703)	(1.448)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	35.20%	35.20%	52.90%	33.80%	30.40%	15.10%	-2.57%	19.90%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 (A4) for the variable definitions [the complete regression output (including controls) for the pooled sample].

TABLE 12

Information Acquisition, Firm Attributes and Average Investment Amounts

investor *type* = 1 (0) if *Øamount* ≥ (<) 500								
Dependent Variable	*page_view*				*content_pt*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Content Type	Overview	Financials	Team	Forum	Overview	Financials	Team	Forum
prior_VC	-0.038	0.013	0.013	0.018	-1.384	0.100	2.080	5.621***
	(-1.281)	(0.959)	(0.640)	(1.181)	(-0.950)	(0.053)	(1.122)	(2.840)
type x prior_VC	-0.003	-0.007	-0.006	0.011	-0.179	1.433	-5.945***	1.406
	(-0.261)	(-0.296)	(-0.332)	(0.847)	(-0.053)	(0.580)	(-3.294)	(0.437)
patent	-0.054	0.000	0.011	-0.005	-0.262	-4.274***	2.003	1.948
	(-1.623)	(0.040)	(0.780)	(-0.448)	(-0.346)	(-3.545)	(1.566)	(1.044)
type x patent	-0.004	0.002	-0.001	0.011	-0.908	3.173	-4.746**	2.267
	(-0.422)	(0.112)	(-0.040)	(0.762)	(-0.326)	(1.658)	(-2.496)	(0.829)
debt	-0.286***	-0.067**	0.017	-0.030	-2.280	-2.851	0.908	1.205
	(-3.126)	(-2.236)	(0.568)	(-0.842)	(-0.879)	(-0.823)	(0.287)	(0.297)
type x debt	0.010	-0.052	-0.031	-0.040	-2.194	-0.509	-4.700**	-12.143***
	(1.049)	(-1.417)	(-0.694)	(-1.081)	(-0.759)	(-0.158)	(-2.586)	(-2.932)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	10,144	10,144	10,144	10,144	6,441	3,627	1,892	2,231
adj. R^2	35.10%	52.90%	33.70%	55.20%	30.30%	15.00%	-2.03%	20.20%

Notes: This table reports OLS regression results of different specifications that differ with respect to the dependent variable. The t-statistics are based on robust standard errors with one-way clustering by issuance (*i.e.*, firm). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 (A4) for the variable definitions [the complete regression output (including controls) for the pooled sample].

III

Financial Education in the Crowdinvesting Market: Preliminary Evidence from a Randomized Field Experiment

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Abstract

This project studies the effect of online financial education on crowdinvestors' information and investment behavior by conducting a field experiment on *Companisto*, one of the largest German crowdinvesting portals. The randomly administered education program teaches basic and start-up-related investment knowledge. While the experiment is still ongoing, this preliminary report documents the overall research design and explores the determinants of program enrollment, participation, persistence and performance. We find that, while program enrollment is overall positively associated with the investors' crowdinvesting exposure, very inexperienced crowdinvestors are also more likely to enroll. Our results further indicate that enrolled participants' pre-treatment level of 'basic' financial literacy is significantly higher than those of wider populations documented in prior literature. Moreover, we find that investors with a lower self-assessed level of financial education are more likely to participate and also more persistent in taking the online modules. The level of advanced financial literacy is positively associated with both, persistence and performance. Our preliminary findings inform about the general level of financial sophistication of crowdinvestors and the likelihood that low-effort financial literacy interventions reach their targeted audience. After the experiment is completed, we will finalize the project by analyzing the program's effect on financial literacy, as well as individual information and investment behavior.

Keywords: financial education, financial literacy, crowdinvesting, information behavior, investor behavior

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1 Introduction

Crowdinvesting critically depends on the wisdom of the crowd (see Schwienbacher and Larralde 2012 and Bradford 2012 for a related discussion)[90]. However, as has been documented by prior work on financial literacy[91], a substantial share of the worlds' adult population still lacks basic financial knowledge (see Lusardi and Mitchell 2014 for a related discussion). While this seems generally relevant as, in recent years, internet-based financial intermediaries (*e.g.*, virtual banks) have been continuously replacing services that have long been provided by traditional financial institutions, the lack of financial literacy seems particularly problematic in settings where subjects need advanced skills for rational investment decisions such as in crowdinvesting (Lusardi and Mitchell 2014). Moreover, as crowdinvesting in many jurisdictions is not subject to traditional securities regulation, the question of financial expertise of crowdinvestors is an area of regulatory concern (Bradford 2012; Lusardi and Mitchell 2014).

In crowdinvesting, internet-based financial intermediaries, so-called crowdinvesting portals (CIPs), support early-stage start-ups to obtain external financing by drawing on relatively small contributions from a relatively large number of mostly (unsophisticated) retail investors (Bradford 2012; Mollick 2014). Given the various services that CIPs provide (*e.g.*,

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[90] As all three studies constituting this Ph.D. thesis investigate investor behavior in crowdinvesting (on *Companisto*), there are certain, and in some cases inevitable, similarities in the structure and contents of these studies. Specifically, as the order of the papers presented in this study reflects the chronology of their first drafts, my second (and third) study build(s) up on my first (and second) study. These similarities are particularly pronounced in the discussion of the related literature [pages 89 to 90 (151 to 152) of the second (third) paper build up on pages 12 to 13 and pages 23 to 29 of the first (and pages 89 to 90 of the second) paper], the description of the institutional environment [pages 91 to 97 (153 to 154) of the second (third) paper build up on pages 17 to 23 of the first (and pages 91 to 97 of the second) paper], and the (discussion of the) variables used in the empirical analysis [pages 98 to 103 of the second paper build up on pages 31 to 38 of the first paper]. As all three studies have not been previously published, for the scope of this dissertation, I generally abstain from self-quotations. However, in places, I discuss the results of my prior studies or name them as examples for prior findings.

[91] As there is no general definition of financial literacy, we follow the definition used by the Organization for Economic Co-operation and Development (OECD, 2016:85) for the 2015 "Programme for International Student Assessment" (PISA) which characterizes financial literacy as the "*knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life*". See Huston (2010) for an overview of selected financial literacy definitions used in the literature.

standardized financial contracts), in many countries, retail investors are typically just a few clicks away from becoming risk capital providers, a role traditionally reserved for professional investors (*e.g.*, Venture Capital firms, Business Angels) (Bradford 2012; Mollick 2013). Due to the highly risky nature of start-up investments, in some countries, regulators require CIPs to educate potential investors (*e.g.*, JOBS ACT, Title III, section 4A(a)(3)).

To study the role of financial literacy and financial education in the crowdinvesting market, we conduct a randomized field experiment that allows us to analyze the effect of a financial literacy intervention on investor behavior. Specifically, in collaboration with *Companisto*, one of the largest German CIPs, we design and conduct an online financial education program comprising around 5.5 hours of web-based interactive training. When the experiment is completed, we will document the effect of this program on retail crowdinvestors' investment activity and their information acquisition prior to investing. For the latter analysis, we will use investor-level Google Analytics data that we obtain in addition to other anonymized investor-level information (*e.g.*, demographics, investment history). This relatively novel type of data allows us to track down investors' web page usage (*i.e.*, information acquisition) on *Companisto*.

While the experiment is still ongoing, we focus this preliminary report on motivating the overall research question and on explaining our research design. In addition, we explore the decision of our randomly selected subjects to enroll and to participate in the education program as well as their persistence and performance during the program. We model the enrollment decision based on prior investment behavior and personal demographics of our invited subjects. Our findings suggest that investors that self-reported to have less than one year of experience with (crowd)investing and similar investment forms, have a higher propensity of enrolling into the program than other investors. In addition, we show that, overall, investors with more exposure to the crowdinvesting market are also more likely to enroll. Furthermore, as we measure

the pre-treatment level of financial literacy of all enrolled crowdinvestors, we can compare their level of financial literacy with levels of financial literacy documented by prior studies. Consistent with related evidence for general investors (Krische 2014), we find that, compared to survey samples representative for the overall population, crowdinvestors exhibit a significantly higher level of 'basic' financial literacy. In a next step, we analyze the determinants of program participation and find a negative association between investors' self-assessed level of financial education and their likelihood of program participation. This finding is consistent with investors that assess their financial educational background to be weak to be more likely to participate in financial literacy interventions. Also, this investor group is more persistent in attending the program. However, we also document that overall, higher levels of financial literacy are also related positively to the likelihood of program participation and persistence. Finally, we document a positive association between program performance and participants' advanced level of financial literacy and their investment skills.

We designed the content covered in the online financial education program in collaboration with *Companisto* to improve investors' 'basic' financial knowledge (*e.g.*, about different investment opportunities, interest compounding, and on the association between risk and return), their competence about the asset classes that are offered on *Companisto*, as well as their ability to evaluate the risk and return profile of early-stage start-ups. We thereby focus our analysis on both, investors' financial knowledge and their ability to apply respective concepts in a crowdinvesting context (Huston 2010).

While this is an interim report about an ongoing research project, we contribute to the literature by providing compelling descriptive evidence for a surprisingly high level of financial literacy among crowdinvestors. In addition, we document that, overall, better informed investors are more likely to participate in low-effort online financial literacy interventions. However,

after controlling for this general trend, we also document that inexperienced investors and investors that are assessing their financial education level to be low are more likely to obtain training. While the prior result is in line with the general findings of the literature, the latter lends some support to the hope that financial literacy interventions might be reaching their main targeted users.

Once completed, the empirical evidence provided by this project will also add to the literature on the causal effects of financial literacy and on the behavior of crowdinvestors. With regards to the first dimension, we will add to a series of studies that investigate the effects of financial literacy interventions on various of financial outcomes (see Fernandes *et al.* 2014 and Miller *et al.* 2015 for an overview).[92] In their meta-analysis, Fernandes *et al.* (2014) find that (standardized) effects of financial literacy interventions are generally weak. Specifically, it appears that the effect sizes of financial education programs are negatively associated with the putative precision of the identification strategy. Studies with randomized treatment assignment, for example, tend to show small or no (statistically) significant effects. Moreover, while the effectiveness of financial education does not seem to vary with the studied financial behavior, the type (intensity) of the intervention seems to be (positively) associated with observed effect sizes. Also, Fernandes *et al.* (2014) show that the effects of interventions are increasing in the average income within the sample, while it does not seem to influence the effect size whether participation in the intervention is voluntary or imposed on the participants.

We will add to this stream of literature in three ways. First, we will be the first to assess the effectiveness of financial literacy interventions in crowdinvesting markets by assessing the pre- and post-financial literacy of our subjects. Second, by examining the effect of a financial

[92] Experimental studies provide mixed evidence on the effects of financial literacy interventions on various financial outcomes, *e.g.*, saving decisions (*e.g.*, Becchetti *et al.* 2013; Cole *et al.* 2013), borrowing decisions (*e.g.*, Collins 2012; Bruhn *et al.* 2013), investment decisions (*e.g.*, Clark *et al.* 2014; Drexler *et al.* 2014) and retirement planning (*e.g.*, Cai *et al.* 2015). See Fernandes *et al.* (2014) for an overview of the experimental evidence and the standardized effect sizes, respectively.

literacy intervention on investors' actual investment decisions, we will study how financial education affects retail investors' behavior. Third, we will further contribute to research on the determinants of retail investors' information behavior by providing investor-level field evidence on the role of financial literacy for retail investors' information acquisition prior to investing. Prior (mostly survey-based) evidence suggests that retail investors' information acquisition is associated with their demographics (*e.g.*, Drake *et al.* 2017; Hemaidan 2017b) and their level of financial sophistication (*e.g.*, Elliott *et al.* 2008; Ernst *et al.* 2009). Closely related to our study is the evidence presented by Hemaidan (2017b) who investigates retail investors' information acquisition. Using investor-level Google Analytics data from *Companisto*, he finds that investors make investment decisions without even accessing a large fraction of start-ups' (financial) disclosure on the CIP. His results further reveal a negative association between investors' information acquisition and the presence of potential signals of start-up quality (*e.g.*, patents, professional co-investments). We build up on this evidence by analyzing how these findings are affected by a manipulation of investors' financial literacy.

A growing body in the empirical literature seeks to understand the determinants of investor behavior in the crowdinvesting market (see Moritz and Block 2016 and Wallmeroth *et al*. 2017 for an overview of the crowdfunding literature). Most of these studies examine how firm characteristics (*e.g.*, Ahlers *et al.* 2015) and the dynamics of the funding process (*e.g.*, Hornuf and Schwienbacher 2016b; Block *et al.* 2016) are related to funding outcomes. Due to the limited availability of investor-level data, there is, however, only scarce evidence on how the information (*e.g.*, Bernstein *et al.* 2017; Hemaidan 2017b) and investment behavior (*e.g.*, Wallmeroth 2016; Hemaidan 2017a) of crowdinvestors vary with their characteristics. By analyzing the role of financial literacy for crowdinvestors' information and investment behavior, we will thus contribute to this second stream of research.

The remainder of this paper is organized as follows. Section 2 provides background information on crowdinvesting (on *Companisto*). The research design (data) underlying the empirical analyses of this study is explained in Section 3 (4). In Section 5, we present preliminary descriptive evidence on participants' pre-treatment level of financial literacy and on the determinants of program enrollment, participation, persistence and performance. Section 6 concludes and provides an outlook on the next steps taken in the analyses of the effect of the financial education program.

2 Crowdinvesting on *Companisto*

Crowdinvesting is a special form of crowdfunding, which according to Mollick (2014:2) „refers to the efforts by entrepreneurial individuals and groups (…) to fund their ventures by drawing on relatively small contributions from a relatively large number of individuals using the internet, without standard financial intermediaries." Prior literature (Ahlers *et al.* 2015; Hornuf and Schwienbacher 2016a,b, 2017) identifies four major forms of crowdfunding that differ with regard to the return that backers obtain for the contributions. In contrast to other forms of internet-based crowdfunding, where contributions are mainly driven by an intrinsic motivation to support charitable projects (donation-based crowdfunding) or provided in return for a desired product (reward-based crowdfunding), in crowdinvesting, contributions are rather driven by the intention to realize a financial return. However, unlike certain forms of crowdlending (*e.g.*, peer-to-peer lending), where investors grant loans to other individuals, in crowdinvesting, investors typically provide financing for early-stage start-ups. While crowdinvesting comprises the sale of debt, mezzanine or equity(like) securities, investors typically obtain a pro-rata share in the profits and (in case of an exit) firm value development of the funded venture in return for their contributions. Therefore, crowdinvesting is often also referred to as equity-based crowdfunding. CIPs, such as *Companisto*, are key to the success of this novel form of financial market. The services that they provide (*e.g.*, standardized financial contracts, advertisement of the

issuance on their portal website) enable start-ups to collect external financing by offering financial securities to the general public. In return for these services, CIPs typically charge a fee of around ten percent of the funded amount (Ahlers *et al.* 2015; Hornuf and Schwienbacher 2016a,b, 2017).

Following the adoption of the German Small Investor Protection Act in 2015, in Germany, the maximum investment amount without the obligation to register with the financial authorities and thus without the requirement to issue a prospectus is limited to (10,000 Euro) 2.5 million Euro per (investor) issuance (see Klöhn *et al.* 2016 for a detailed discussion of this regulation). German CIPs (including *Companisto*) typically use two forms of subordinated participation loans which are either designed as debt (*i.e.*, fixed-interest) or as equity-like securities. While being economically comparable to equity, the latter form does typically not transfer any voting rights (Hornuf and Schwienbacher 2016b, 2017).

[Figure 1 about here]

The German Small Investor Protection Act also requires CIPs to provide investors with a three-page prospectus that summarizes key aspects of the start-up (*e.g.*, financial leverage, shareholder structure). Also, start-ups are required to provide the most recent annual reports. In addition to legal disclosure requirements, *Companisto*, for example, requires start-ups to provide a pitch video, narrative information on the business model and target market, profiles of the managing team as well as selected financial information (*e.g.*, EBIT forecasts) including a discussion of the assumptions underlying firms' financial projections. The information environment of issuances on *Companisto* (see Figure 1) generally exhibits a fixed structure with each issuance containing similar information sections (*e.g.*, financial forecasts, profiles of the managing team).

3 Research Design

3.1 Measuring Financial Literacy

Before investors are granted access to the contents of the online financial education program, they must first complete an "Entry-Level-Test" (ELT) comprising 14 questions used to measure participants' financial literacy along with other selected concepts.[93] Our 'basic' financial literacy index (*fin_literacy*) is based on the first three ELT questions on fundamental concepts in economics and finance that were introduced by Lusardi and Mitchell for the 2004 U.S. Health and Retirement Study (HRS)[94]. The questions have since been extensively used in the (academic) literature[95] to measure individuals' (1) ability to perform simple calculations related to interest rates as well as their understanding of (2) the effect of inflation and (3) the fundamentals of risk diversification (Lusardi and Mitchell 2011). Based on these questions, we are able to compare participants' pre-treatment level of financial literacy with the level of financial literacy documented in prior literature (*e.g.*, Krische 2014).

Our second index (*adv_fin_literacy*) captures participants' 'advanced' financial literacy comprising two questions that measure participants' understanding of the key attributes of equity and debt securities (ELT-Q4) and the association between risk and return (ELT-Q5).

Lastly, our third index measures investors' (start-up related) investment skills (*inv_skills*). The index is based on four questions that, to our best knowledge, are unique to this study and are used to measure participants' ability to evaluate the business model and target market of a start-up (ELT-Q6), their understanding of the fundamentals in company valuation (ELT-Q7) as well as specific approaches used for the valuation of early-stage start-ups (ELT-

[93] See Appendix A4 for more information on the ELT design and Appendix A5 for the exact wording of the ELT questions.

[94] See Lusardi and Mitchell (2011) for an overview of the questions used in the 2004 U.S. HRS.

[95] The questions have been previously used by, *e.g.*, FINRA Foundation (2009), van Rooij *et al.* (2011), Krische (2014) and Agrawal *et al.* (2015).

Q8). Moreover, we measure participants' general understanding of factors that should (not) be considered when making start-up investments (ELT-Q9).

We calculate each index as the unweighted sum of points gained from answering the underlying ELT questions correctly. Specifically, participants obtain one (zero) point(s) per (in)correct answer. In addition, we measure both participants' self-assessed level of financial literacy (*fin_lit_self_assessed;* ELT-Q1) and financial education (*fin_ed_self_assessed*; ELT-Q2) on a seven-point Likert scale, standardized to values ranging from zero to one, with higher values indicating higher levels of knowledge or education. Also, we capture participants' numerical skills (*numeracy*; ELT-Q12), their degree of *risk_aversion* (ELT-Q13) along with their *time_preferences* (ELT-Q14). The numeracy score is based on a standard question developed by prior literature (Frederick 2005) and takes the value of one if investors answer the respective ELT question correctly.[96]

3.2 Financial Literacy Intervention

The online financial education program (*i.e.*, our intervention or treatment) is solely available in German and comprises three levels with three modules each and thus a total of nine modules (see Figure 2 for a conceptual overview). The modules cover various topics related to personal finance and start-up investments. Each module comprises five to ten screen pages and contains interactive elements (*e.g.*, check-up questions) that were included to increase participants' learning experience and that allow us to track their learning process. At the end of each module, participants can test their knowledge in a "Module-End-Test" (METs). After three modules, a level is completed. To finish a level (*i.e.*, to get access to the respective "Level-End-Test", LET), participants are required to finish all three METs of the respective level. Both the METs and LETs contain variations of the questions that are already included in the ELT and

[96] In this preliminary report, we do not use *risk_aversion* nor *time_preferences* as the answers to the underlying questions are yet to be coded.

thus allow us to measure how investors' financial literacy changes during their participation in the program.[97] This also enables us to explore factors associated with participants' (test) performance. For each test (ELT, MET and LET), participants receive a detailed explanation of the correct answer. Test participation should therefore also have a (direct) positive effect on participants' financial literacy.[98] Taken together, the program (including all tests) comprises around 5.5 hours of web-based training.[99]

[Figure 2 about here]

Given that firms' information environment on *Companisto* typically reflects a large fraction of their overall (and generally low) information environment (see Michels 2012 for a related discussion), the program contains an overview of the (structure of the) information that is typically provided for issuances on *Companisto*.[100] The contents included in the intervention should therefore not only increase participants' (start-up-related) investment knowledge but also their ability to apply this knowledge on *Companisto* (Huston 2010).

3.3 Experimental Design

We start our experiment by inviting a randomly selected group of registered investors on *Companisto* to participate in the "BETA-Test" of our online financial education program that can be accessed through the *Companisto* web-page.[101] Specifically, on July 2, 2017, 75 (25)

[97] The exact wording and/or question type varies within a question pool. However, each pool of questions (from which test questions are randomly selected) tests for the same concept(s). See Appendix A3 for more detailed information on the design of the METs and LETs.

[98] Participants are generally able to improve their test results by re-taking each MET at will while still having access to prior test results (including an explanation of the correct answer).

[99] While this will vary across modules, finishing a module including the respective MET should take participants around 30 minutes in total (15 minutes to work through the module and another 15 minutes to complete the MET). In addition, the ELT and each LET should take participants around 15 minutes. This includes both, completing the test and reading through the correct answers.

[100] Given that, in Germany, the specific contents and structure of the information provided in the scope of crowdinvestings (on *Companisto*) is typically not subject to regulation, the provided information (structure) typically varies across CIPs. Thus, it is important to provide investors with specific information on where to find potentially relevant information related to issuances on *Companisto*.

[101] See Section 4 for a description of the sample selection process (*i.e.*, the randomization approach) and Appendix A6 for the (original) invitation.

percent of the investors in our sample did (not) receive a newsletter with the invitation to participate in an online financial education program and thus reflect our treatment (control) group.[102] To increase the participation rate, the invitation included information on a prize draw among all participants. Specifically, investors were informed that three randomly selected participants would each win a premium grill. The BETA-Test ended on August 20, 2017. To measure the perceived information content and (thus) the perceived usefulness of the online financial education program (*i.e.*, the BETA-Test), a newsletter with a link to a program evaluation survey (comprising six questions) was sent to investors on August 21, 2017.[103] This will, for example, allow us to examine how participants' program evaluation is associated with their (self-assessed) pre-treatment level of financial literacy, their (test) performance and the effect of the financial education program on their information and investment behavior. Figure 3 depicts the general time structure of the experiment.[104]

[Figure 3 about here]

Due to the voluntary nature of our financial literacy intervention, we will not use the actual participation in the online education program to identify the causal effect of financial education on investors' information and investment behavior. To avoid potential self-selection bias, we will instead use the randomized offer to participate in the financial education program as an instrument for the actual participation. The focus of our experiment will therefore lie on

[102] Members of *Companisto*'s so-called "Business Club" (*i.e.*, highly active investors) that are randomly assigned into treatment receive a letter in addition to the newsletter. Only investors that receive an invitation (*i.e.*, were in the treatment group) were able to access the financial education program on the *Companisto* webpage. Naturally, we cannot rule out that members of the control group found out about the financial education program. As this might have affected the information and investment behavior of respective investors either directly or indirectly (*i.e.*, by making them acquire financial knowledge on their own which in turn might has affected their behavior), our results might be subject to bias. However, this should work against us finding any (statistically) significant differences between the two groups.

[103] See Appendix A7 for the original newsletter and the exact wording of the questions included in the program evaluation survey.

[104] See Appendix A2 for more detailed information on the timeline of the project.

the identification of the intention-to-treat (ITT) effect. Figure 4 presents the identification strategy. Our main analysis is going to be based on a difference-in-differences design, which will allow us to test for differences in the change of the investment and information behavior between treatment and control group when comparing the four months prior to the introduction of the BETA-Test (pre-period) with the four months following the end of the BETA-Test (post-period).[105]

[Figure 4 about here]

To get a better understanding of the average effect of the online financial education program on the participants (ATT), we will, in an additional analysis, narrow our investigation to the subset of investors that actually participate in the financial education program. Despite the previously discussed limitations to the generalizability of the related results, we will examine how investors' enrollment, participation and performance in the program is associated with changes of their information acquisition and investment behavior.

3.4 Measuring Program Enrollment, Participation, Persistence and Performance

In this preliminary report, we focus our analysis on the treatment group (*i.e.*, investors that received an invitation to participate in the online financial education program) and the question how program *enrollment, participation, persistence* and *performance* are associated with participants' attributes (*i.e.*, their personal demographics and their additionally provided (profile) information) and, for those that enrolled in the study by finishing the ELT, the different constructs as measured through the ELT (*e.g.*, measured and self-assessed financial literacy). As the intensity of program participation varies across investors, we define three variables, *enrolled*, *participated* and *persistence*. Our first proxy, *enrolled*, is binary coded and takes on a

[105] In February 2017, the structure of the information sections of issuances on *Companisto* has been subject to significant changes. To avoid biases related to this change, we therefore take March 1, 2017 as the starting date of the pre-period of our difference-in-differences analysis (see Figure 4 for the general timeline of the experiment).

value of 1 if an investor has provided answers to the ELT questions that capture her (self-assessed) level of financial literacy and education (ELT Q1 to Q11). This applies to 462 out of 11,575 invited investors. Our second binary indicator, *participated*, takes on the value 1 if an investor has accessed at least one MET or LET after submitting the ELT and thus being granted access to the actual contents of the program (N = 234). To measure the intensity of program participation, we define *persistence* as the natural logarithm of the total number of questions that are answered across all MET and LET tests. Finally, we measure participants' program *performance* as the percentage of correctly answered MET and LET questions.

3.5 Measuring Information Behavior

To measure participants' information acquisition, we will use user-level Google Analytics data that will allow us to track down investors' information selection as well as the time that they spend on the different information sections of crowdinvestings on *Companisto* prior to investing. Building up on Hemaidan (2017b), who uses similar data to investigate how investor and firm attributes as well as the dynamics of the funding round are related to investors' information behavior on *Companisto*, we will be able to examine how investors' information behavior changes through our financial literacy intervention. In a first step, we will investigate how participants' (self-assessed) pre-treatment level of financial literacy, their risk preference and their time value of money assessment are related to their information behavior. As an effect of the online financial education program, we generally expect participants to increase their usage of the information provided in the different sections on *Companisto*. Specifically, we expect them to access more information prior to investing. A major finding of Hemaidan (2017b) is that investors neglect a large fraction of the (financial) information provided on *Companisto*, which might be driven by the fact that investors are not able to identify and/or process the respective information. This would be consistent with related research on investors' information behavior in traditional capital markets indicating that both investors' choice of

(*e.g.*, Elliott *et al.* 2008) and ability to process information (*e.g.*, Frederickson and Miller 2004) are associated with their level of sophistication (see Cascino *et al.* 2013, 2014 for an overview and a more detailed discussion). The findings of Hemaidan (2017b) might, however, simply reflect investors' lack in familiarity with the information environment on *Companisto*. Given that our online financial education program provides both (i) information on (how to process) potentially decision-useful information related to start-up-investments and (ii) an overview of the specific information (sections) on *Companisto*, we expect investors' information behavior [*i.e.*, their likelihood of accessing crowdinvesting-related information (sections)] on *Companisto* to be positively affected by program participation. Consistent with the evidence provided by Mason and Harrison (1996), we argue (and teach investors) that even if certain information might not necessarily be decision-useful at face value (*e.g.*, start-ups' financial forecasts), it might still be informative with regard to the characteristics (*e.g.*, competence, degree of optimism) of the managing team.

Our second information acquisition proxy of interest is the time that investors spend with the acquisition of information provided on *Companisto*. Specifically, the user-level Google Analytics data allows us to measure the aggregated time for which investors have opened each information section of a crowdinvesting in their browser prior to investing. An increase in investors' financial literacy might decrease the time that it takes them to identify and process (potentially) relevant information. However, it might also be the case that an increase in financial literacy causes investors to screen (and process) information that they previously neglected leading to an increase in the measured time that they spend on the acquisition of information in the respective information section. It is therefore not possible to clearly predict how participation in our financial education program will affect the time that investors have certain information sections opened in their browser prior to investing.

3.6 Measuring Investment Behavior

To investigate the effect of the online financial education program on investors' investment behavior on *Companisto*, we will focus our analysis on the frequency, timing and volume (per start-up and in total) of investments. Given that one entire module of the program focuses on the concept of risk diversification, we expect that, compared to individuals from the control group[106], in the post-treatment period, program participants will invest smaller amounts (per start-up) on *Companisto*. We are further interested in whether participation in the program affects the timing of investments, *i.e.*, the stage of the crowdinvesting campaign at which participants invest. Prior evidence on the investment behavior of crowdinvestors suggests that investments by others affect investors' investment behavior (*e.g.*, Vismara 2017). Kim and Viswanathan (2016) show that this phenomenon is more pronounced following investments by 'experts'. If investors perceive others to be more sophisticated, they might regard respective investments as signals of quality (*e.g.*, Moritz *et al.* 2015). Following this rationale, more sophisticated investors might rather rely on their own evaluation of a start-up instead of free-riding on the know-how and due diligence of others. Therefore, we expect a manipulation of investors' financial literacy to affect the timing of their investments. However, it is not clear whether investors will invest at earlier (*e.g.*, because they don't wait for the behavior of others) or at later stages (*e.g.*, because they invest more time in their own due diligence). In any case, we expect the investment behavior of treated investors to be less clustered around investment activities of supposedly more sophisticated investors.

Naturally, it would be interesting to study whether the program induces investors to take "better" investment decisions. Wallmeroth (2016), for example, uses a self-generated user-level

[106] On June 14, 2017, the minimum investment amount on Companisto was raised from 5 Euro to 100 Euro. Thus, for some investors, the amount invested per start-up as well as the aggregated amount invested on *Companisto* should have since increased. However, we expected that this effect is less pronounced for individuals that (receive an invitation to) participate in the education program.

data set of investments on *Companisto* to study the likelihood of different types of investors to invest in ventures that fail (*i.e.*, go bankrupt). While we will add to this question by studying whether investors that (were invited to) participate acquire more information and thus, from an *ex ante* perspective, take better informed decisions, at this point, it is not possible to analyze the relative *ex post* performance of their investments. This will, however, be possible once the first start-ups that collected funds during the *ex post* period of our analysis either go insolvent or accomplish to obtain additional financing (profitably sell the firm). Nevertheless, we will examine whether the investment behavior of our treatment group becomes more similar to the pre-treatment behavior of individuals that scored relatively high financial literacy scores in the ELT. Moreover, given that we have additional information on the investment behavior of institutional investors that are included in our sample (*i.e.*, registered as "companies" on *Companisto*), we will analyze whether the investment decisions of our (intended) treatment group become more comparable to the behavior of institutional investors.

4 Data

We start our sample selection by identifying a sample of investors that we use as a basis for our randomization procedure, *i.e.*, from which we can randomly select a treatment group that receives an invitation to participate in our online financial literacy intervention. Out of the 69,955 users that were registered on *Companisto* as of June 14, 2017, we therefore, in a first step, drop all investors that do not want to receive email-news updates (n = 3,305) or letters from *Companisto* (n = 166). Moreover, as in our main analysis, we want to compare how investors' information and investment behavior changes from the pre- to the post-treatment period, we drop 50,014 registered users that have not yet invested on *Companisto*.[107] Additionally, as we want to focus our analysis on retail investors, we exclude 367 users that are registered as

[107] Also, investors are not required to provide certain information (*e.g.*, their gender, address and whether they invest on their own account or for an institution) before their first investment. An inclusion of registered users that have not yet invested on *Companisto* would therefore limit and potentially bias our analysis.

"company" (*i.e.*, institutional) investors from our sample. Given that the contents of our online financial education program (*i.e.*, our treatment) are solely provided in German, we drop 662 investors located in countries other than Germany, Austria or Switzerland. After further excluding all remaining individuals with missing user information, we obtain a final sample of 15,433 investors. Panel A in Table 1 depicts the sample selection process.

[Table 1 about here]

From this sample, which includes 1,174 "Business Club" members (*bc* = 1; 0 otherwise), we randomly select our treatment group. Given the low participation rates documented in prior voluntary financial education programs (*e.g.*, Bruhn *et al.* 2013) and the low average effect sizes of prior studies with comparable identification strategies as we use in our main analysis (*e.g.*, Fernandes *et al.* 2014), we select 11,575 (75 %) as our treatment group. We conduct the randomization process by drawing from six buckets [country (Austria, Germany and Switzerland) X investor type (*bc* members and all other investors)].[108] Thereby, we ensure that our treatment and control group do not differ in the relative share of active investors and investors from the three countries included in our sample. Moreover, we require our treatment and control group to be comparable in the distribution of selected investor characteristics that might affect participation in the financial education program and (thus) its effect and that might also be directly associated with investors' information and investment behavior. Specifically, we balance our treatment and control group with regard to investors' *age*, *gender* (male = 1; 0 otherwise), portfolio size (*nr_startups*) and recent investment activity (*active* = 1; 0 otherwise). A comparison of the two samples (see Panel B in Table 1) shows the success of our randomization process as we do not find any (statistically) significant differences in the above-men-

[108] We conduct the randomization process without repetitions. However, for our randomization results to be replicable, we set a seed value (40055562 = first numbers of a barcode of a card game).

tioned dimensions. Specifically, Panel B in Table 1 shows that for both our treatment and control group, the average investor is around 38 years old, male and has invested in at least 3 start-ups. Moreover, we find that only a third (7.5 percent) of all investors in our sample have invested at least once in the past 12 months (are members of the Business Club). Most investors in our sample are located in Germany (90.6 percent). Only 5.8 (3.6) percent live in Austria (Switzerland).

5 (Preliminary) Results

5.1 Descriptive Statistics

5.1.1 Determinants of Program Enrollment

From the 11,575 investors that received an invitation to participate in the online financial education program 462 (four percent of) individuals entered the ELT and provided answers to questions 1 to 11 allowing us to measure their level of (self-assessed) level of financial literacy (see Panel A in Table 2). However, only around 50 percent (n = 234) of these investors accessed at least one MET or LET, *i.e.*, worked through (parts of) the contents of the financial education program.

[Table 2 about here]

Panel B in Table 2 shows that the likelihood of enrollment is higher for male, *active* and business club investors and is increasing in the number of start-ups and the accumulated amount (*total_amount*) that individuals invested on *Companisto*. Also, the 42.30 percent of investors that, in their profile on *Companisto*, provided information on their years of experience with risk capital investments (*took_survey* = 1; 0 otherwise) are more likely to enroll into the program. The same holds for the 2.70 percent of investors that self-reported to have less than one year of

experience with crowdinvesting and comparable investment forms (*inexperienced* = 1; 0 otherwise).[109]

5.1.2 ELT Results (Financial Literacy Scores)

[Table 3 about here]

Panel A of Table 3 shows the results of the ELT including the financial literacy scores for the 462 investors that provided answers for the respective questions ('enrollment sample'). While subjects self-assessed their level of both financial literacy (0.573) and financial education (0.537) to be rather moderate, almost all investors answered the questions underlying the financial literacy score correctly [mean (maximum) score = 2.95 (3.00)].[110] This score is significantly higher than the results of related studies that use a similar set of questions for their financial literacy score (see Lusardi and Mitchell 2014 for a cross-country overview). Bucher-Koenen and Lusardi (2011), for example, find that only 56.8 percent of the surveyed households from a representative German household panel answered all three questions underlying *fin_literacy* correctly. Consistent with the findings of van Rooij *et al.* (2011) who show a positive link between financial literacy and stock market participation, our findings strongly suggest that, compared to the 'average German household' (in 2009)[111], (crowd)investors exhibit a significantly higher level of financial literacy. In line with other cross-country evidence (see Lusardi and Mitchell 2014 for an overview), Bucher-Koenen and Lusardi (2011) show that the financial literacy score is higher for individuals aged between 35 and 50 years and thus the average subject in our sample. In contrast to other studies, the evidence presented in Panel B in Table 3,

[109] In a multiple regression analysis that includes both *took_survey* and *inexperienced* (see Table 5), we show that having self-reported to be *inexperienced* has incremental explanatory power for the decision to enroll.
[110] See Appendix A8 for the question-level scores and a comparison with the findings of related studies.
[111] Bucher-Koenen and Lusardi (2011) rely their analysis on survey data from 2009.

however, does not suggest a statistically significant difference between male and female participants.

It appears that participants have had slightly more trouble answering the questions underlying our advanced financial literacy score [mean (maximum) score = 1.65 (2.00)]. While most seem to have a general understanding of the relation between risk and return (94 percent of correct answers), 'only' 73 percent of participants answered the question on (differences in) the attributes of equity and debt correctly.[112, 113]

The average *inv_skill* score [mean (maximum) score = 2.02 (4.00)] indicates that, while being generally financially literate, a large share of participants lack (start-up-related) investment knowledge. Slightly more than 62.3 percent of participants answered the numeracy[114] question correctly.[115]

We find a positive association between participants' self-assessed level of financial literacy, their age and investment activity (*e.g.*, their number of start-ups, total investment amount and business club membership) on *Companisto* (see Panel B in Table 3). Also, male investors appear to be more confident regarding their financial literacy and financial education than female investors. The level of self-assessed financial education (literacy) is positively associated with participants' level of (financial literacy and their level of) advanced financial literacy and investment skills suggesting that they are generally able to correctly self-assess their level of

[112] For certain question types (*e.g.*, check box tables, where more than one 'check' is required to answer the question correctly), we calculate the share of correct answers (see Question 6 in Appendix A5 for a specific example). Partially correct answers (our test scores) are therefore not restricted to integers.

[113] See Appendix A8 for the question-level scores.

[114] We acknowledge that the underlying question might not perfectly (solely) capture participants' numerical skills, which is also reflected in its inconsistent use in the academic literature. While some related studies (*e.g.*, Fernandes *et al.* 2014) use a comparable question to capture participants' numerical skills, others (*e.g.*, Krische 2014) use it as a proxy for subjects' "quantitative reasoning". While we label the resulting score as "numeracy", we regard it as a good proxy for participants' general numerical and analytical skillset.

[115] Unfortunately, there was an inconsistency in the question wording that appears to have confused early ELT participants. If we only consider participants that took the ELT after we adjusted the question wording, we obtain a mean mean *numeracy* score of 78.7 % based on 267 observations. Given this problem, we exclude *numeracy* from our main regression analysis.

financial knowledge. In contrast to other studies (*e.g.*, Krische 2014), we only find a statistically significant association between participants' numerical skills and their level of advanced but not basic financial literacy.

5.1.3 Determinants of Program Participation, Persistence and Performance

Consistent with our results related to the likelihood of enrollment, we find that the propensity of working through the program (*participated* = 1) after completing the relevant parts of the ELT (*enrolled* = 1) is higher for active and business club investors and increasing in the number of start-ups and the total investment amount. However, while male investors are more likely to enroll, we do not find a statistically significant association between *participation* and *gender* (see Table 3).[116]

The decision to participate in the financial education program appears to be neither associated with participants' self-assessed financial literacy and education nor related to their (advanced) financial literacy score. However, the likelihood that subjects actually work through the program is increasing in their investment and numerical skills indicating that those who would benefit the most do not participate in the program. This is consistent with the evidence provided by Lusardi and Mitchell (2011) who find a positive association between retail investors' demand for financial advice and their financial literacy.[117]

[Table 4 about here]

[116] This result might be driven by male investors who, compared to female investors, solely enrolled in the program in order to win one of the three grills. As there was no information provided on whether participation in the respective draw was restricted to subjects that actually participated in the program, respective investors would have had no clear incentive to access the program contents. While it is not surprising that more active investors are also more likely to follow the invitation to participate in the online financial education program, we are pleased to observe that those investors who appear to need it most (*i.e.*, investors that self-reported to be inexperienced) also have a higher propensity of enrollment.

[117] However, the evidence on the relationship between retail investors' demand for financial advice and their financial literacy and investment competence is ambiguous. While some studies document a negative association (*e.g.*, Hung and Yoong 2010; Kramer 2012), other studies (*e.g.*, Lusardi and Mitchell 2011; Bachmann and Hens 2015) find a positive association, indicating that individuals who would potentially benefit the most are the least likely to seek professional financial advice.

In line with these results, we further find a positive association between the *persistence* of program participation and both individuals' self-assessed level of financial literacy and their advanced financial literacy score (see Panel B in Table 4). Moreover, our results indicate that business club membership and the accumulated investment amount on *Companisto* are positively associated participation *persistence*.

Consistent with expectations, we find that participants' test *performance* is increasing in their pre-treatment levels of advanced financial literacy and *numeracy*. Moreover, we find a positive association between test *performance* and *persistence* which would again be consistent with prior evidence suggesting a positive association between program participation and financial literacy. This might, however, also indicate that our financial education program actually helps improving individuals' test performance (*i.e.*, financial literacy).[118]

5.2 Multiple Regression Analysis

To test whether the presented correlations are robust to a multiple regression analysis, we run four separate regressions that differ in the dependent variable and (thus) the applied estimation method.

[Table 5 about here]

We start our analysis by modelling the first decision that invitees must take with regard to (the intensity of) their participation in the program as a function of their personal demographics and investment behavior on *Companisto* (see Column 1 in Table 5). As the decision to enroll (*enrolled*) is coded binary, we run a logistic regression and find that younger male investors, business club members and investors with stakes in more start-ups are more likely to

[118] While we only consider unique questions for the calculation of *persistence* and *performance*, it should be noted that certain questions pools that are used in the (ELT and) METs are also part of the respective LET.

enroll. Moreover, we find a positive statically significant relation between *enrolled* and *inexperienced* indicating that investors that self-reported to have less than one year of experience with crowdinvesting and comparable investment forms are more likely to enroll.

Next, we analyze how the next decision that investors must take, namely whether or not they work through the contents of the education program and take the tests at the end of at least one module or level, is associated with investor attributes. We thus run another logistic regression with *participated* as dependent variable (see Column 2 in Table 5). While investor demographics and their investment behavior do not seem to be associated with their propensity to participate in the program, we find that the likelihood of program participation is positively associated with individuals' investment skills, while it is negatively associated with their self-assessed level of financial education. While the former result indicates a general tendency of more knowledgeable investors to participate, the latter result is consistent with individuals that believe to need it the most also being more likely to work through the online financial education program.

Consistent with this evidence, an OLS regression with *persistence* as dependent variable yields a negative estimated coefficient on the self-assessed level of financial education (see Column 3 in Table 5). However, we find a positive association between *persistence* and the self-assessed level of financial literacy. Interestingly, our results show that while male investors are more likely to enroll, compared to female participants, they are less persistent in their participation. In line with expectations, we find that business club members (*i.e.*, rather active investors) are more persistent than other participants.

Finally, running an OLS regression with *performance* as dependent variable, we find a positive association between participants' test *performance* and their level of advanced finan-

cial literacy and investment skill, consistent with more financial literate investors (widely defined) to perform better in our training program. While this result per se is hardly surprising, it lends some support to the robustness of our performance measure. We will explore the actual effect of our training program on the financial literacy of our subjects at later stages of our project.

6 Conclusion

In this project, we investigate the effect of an online financial education program on crowdinvestors' information and investment behavior by conducting a field experiment on *Companisto*, one of the largest German crowdinvesting portals. The education program trains 'basic' and start-up-related investment knowledge. While the experiment is still ongoing, in this preliminary report, we depict the overall research design. Moreover, we explore the determinants of program enrollment, participation, persistence and performance.

Taken together, the empirical evidence presented in this preliminary report indicates that (crowd)investors exhibit a high level of 'basic' financial literacy. Moreover, we find that investors that self-report to be rather inexperienced with risk capital investments or that assess their own level of financial education to be low are more likely to enroll and are also more persistent participators of the program. However, in line with prior studies, this finding only manifests after controlling for an overall tendency of more financially literate and experienced investors to participate (intensively) in the education program. While the latter results are similar to other studies that investigate the determinants of program uptake for voluntary financial literacy interventions, we believe that the surprisingly high level of basic financial literacy that we document helps to assess the overall efficiency of the crowdinvesting market and is relevant for developing the regulatory design of the crowdinvesting market.

As a next step, we will examine whether subjects' financial literacy changes over their participation in the program. Finally, after the experiment is completed, we will analyze the program's effect on investors' information and investment behavior.

A Appendix

A1 Variable Definitions

Variable	Definition
t	(If not differently specified:) June 14, 2017
Investor Attributes	
$age_{i,t}$	Age of investor i
$gender_{i,t}$	Gender of investor i
$country_{i,t}$	Country of residency of investor i
$nr\_startups_{i,t}$	Number of unique start-ups investor i holds in her portfolio
$active_{i,t}$	Binary coded variable with 1 (0) indicating that investor i has (not) invested at least once on *Companisto* in the past 12 months, *i.e.*, in the period June 15, 2016 to June 14, 2017
$bc_{i,t}$	Binary coded variable with 1 (0) indicating that investor i is (not) a member of *Companisto*'s Business Club (membership is granted based on investors' investment and forum activity)
$total\_amount_{i,t}$	Total amount that investor i has invested
$took\_survey_{i,t}$	Binary coded variable with 1 (0) indicating that investor i has provided profile information on her general experience with (risk capital) investments
$inexperienced_{i,t}$	Binary coded variable with 1 (0) indicating that investor i has less (more) than one year of experience with the "types of financial investments" offered on *Companisto*
Program Participation Measures	
$enrolled_i$	Binary coded variable with 1 (0) indicating that investor i has (not) provided (*i.e.*, entered and saved) an answer to ELT questions 1 to 11
$participated_i$	Binary coded variable with 1 (0) indicating that investor i has (not) accessed at least one MET
$persistence_i$	Natural logarithm of the total number of unique questions that investors that *participated* (=1) in the education program has answered (*i.e.*, entered and saved) across all tests of the education program (*i.e.*, including all METs and LETs)
$performance_i$	Percentage of correct answers to unique questions that investor i provided across all tests of the education program (*i.e.*, including all METs and LETs)

A1 Variable Definitions *(continued)*

Variable	Definition
Measured Concepts	
$fin\_lit\_self\_assessed_i$	Self-assessed level of financial literacy. Measured on a (standardized) scale from (0) 1 to (1) 7; with a higher value indicating a higher level of self-assessed financial literacy
$fin\_ed\_self\_assessed_i$	Self-assessed level of financial education. Measured on a (standardized) scale from (0) 1 to (1) 7; with a higher value indicating a higher level of self-assessed financial education
$fin\_literacy_i$	Financial literacy score calculated as the unweighted sum of points gained from answering ELT questions 3 to 5; with false (correct) answers resulting in a value of 0 (1)
$adv\_fin\_lit_i$	Advanced financial literacy score calculated as the unweighted sum of points gained from answering ELT questions 6 and 7; with false (correct) answers resulting in a value of 0 (1)
inv_skills_i	Advanced financial literacy score calculated as the unweighted sum of points gained from answering ELT questions 8 to 11; with false (correct) answers resulting in a value of 0 (1)
$numeracy_i$	Binary coded variable with (0) 1 indicating that ELT question 12 was (not) answered correctly

A2 Timeline of experiment

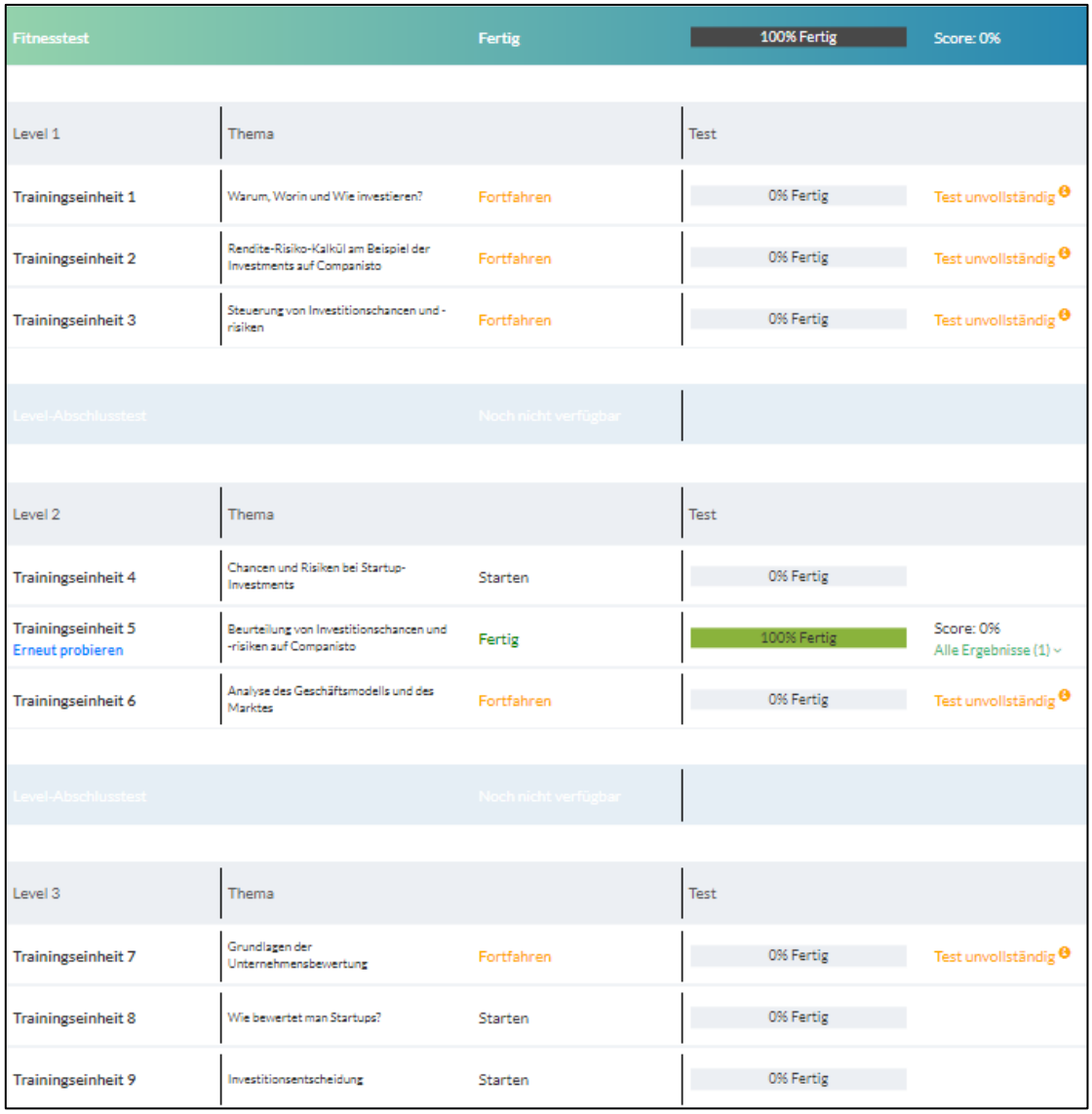
Date	Event	Subsequent steps taken by HU[119]
Mar 24, 2015	Kick-Off meeting with *Companisto*	Preparation of financial education concept
Aug 25, 2015	Agreement on general concept for financial education program (see Figure 2) with *Companisto*	Preparation of exemplary scripts for first education modules
Feb 24, 2016	Discussion of exemplary scripts for module contents with *Companisto*	Project start – elaboration of (remaining) module scripts
Mar, 2016	Signing of collaboration contract	
Feb 2, 2017	Concluding discussion of contents (*i.e.*, module scripts) of financial education program	Assistance in implementation of financial education program on *Companisto* web page
Feb, 2017	Information structure of issuances on Companisto modified (start date of pre-period for diff-in-diff analyses therefore Mar 1, 2017)	
Jun 14, 2017	Sample selection (randomization) Minimum investment amount on *Companisto* raised from € 5 to € 100	
Jun 28, 2017	Invitation letters are sent to randomly selected "Business Club" (*i.e.*, the most active) investors	
Jun 30, 2017	Start of BETA-Test of Education Tool	
Jul 1, 2017	Invitation newsletter is sent (per email) to randomly selected group of investors (*i.e.*, to all investors in treatment group)	
Aug 20, 2017	End of BETA-Test On Aug 21, link to evaluate BETA-Test is sent per email to participants	Analysis of factors associated with the intensity of participation (*i.e.*, self-selection) in(to) financial education program
Jan 1, 2018	*Expected end of post-period for diff-in-diff analysis (introduction of financial education program to all investors on Companisto)*	Analysis of effect of (invitation to participate in) financial education program on crowdinvestors information and investment behavior

[119] Subsequent steps taken by the Humboldt University of Berlin (HU), *i.e.*, by the authors of this study.

A3 Online Financial Education Program

Before being able to access the contents of the online financial education program, each user must first participate in an "Entry-Level-Test" (ELT; see Appendix A4 for more detail on the ELT).

Online Financial Education Program: Overview



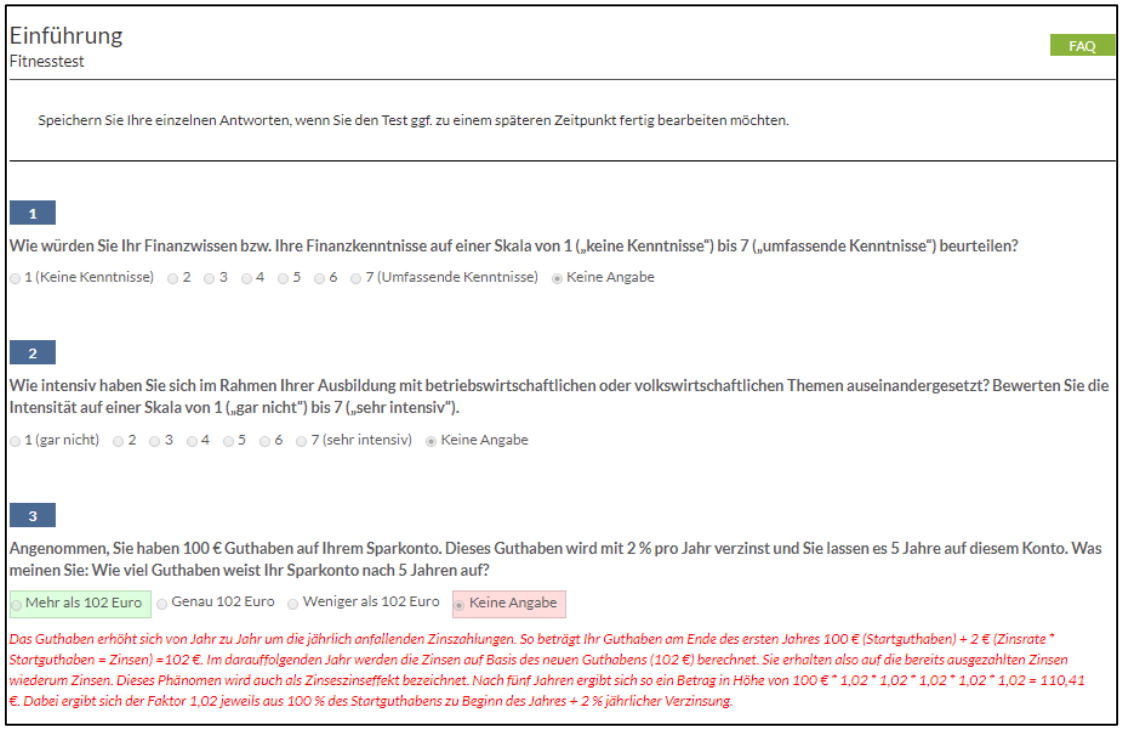
Fitnesstest		Fertig	100% Fertig	Score: 0%
Level 1	Thema		Test	
Trainingseinheit 1	Warum, Worin und Wie investieren?	Fortfahren	0% Fertig	Test unvollständig
Trainingseinheit 2	Rendite-Risiko-Kalkül am Beispiel der Investments auf Companisto	Fortfahren	0% Fertig	Test unvollständig
Trainingseinheit 3	Steuerung von Investitionschancen und -risiken	Fortfahren	0% Fertig	Test unvollständig
Level-Abschlusstest		Noch nicht verfügbar		
Level 2	Thema		Test	
Trainingseinheit 4	Chancen und Risiken bei Startup-Investments	Starten	0% Fertig	
Trainingseinheit 5 Erneut probieren	Beurteilung von Investitionschancen und -risiken auf Companisto	Fertig	100% Fertig	Score: 0% Alle Ergebnisse (1)
Trainingseinheit 6	Analyse des Geschäftsmodells und des Marktes	Fortfahren	0% Fertig	Test unvollständig
Level-Abschlusstest		Noch nicht verfügbar		
Level 3	Thema		Test	
Trainingseinheit 7	Grundlagen der Unternehmensbewertung	Fortfahren	0% Fertig	Test unvollständig
Trainingseinheit 8	Wie bewertet man Startups?	Starten	0% Fertig	
Trainingseinheit 9	Investitionsentscheidung	Starten	0% Fertig	

Notes: This figure displays a screenshot of the overview page of the online financial education program.

The aim of the ELT is to collect information on selected user attributes (*e.g.*, risk aversion, financial education) including their level of basic financial literacy and start-up-investment-specific competence. After completing in the ELT, the user is directed to an overview

page where the structure and the different topics of the education tool are presented (see figure above).

Entry-Level-Test (ELT)



Notes: This figure displays a screenshot of a submitted ELT. Correct (wrong) answers are market green (red). In addition, a detailed explanation of the correct answer is provided.

As the modules do not have to be selected in any specific order, participants can work through the financial education program according to their personal interests. To finish a level [*i.e.*, receive a badge that is displayed in her profile (once the experiment is finished)], a user must first work through all three modules of a respective level and participate in the related "Module-End-Tests" (METs) that are included at the end of each module. Only then, the respective "Level-End-Test" (LET) becomes accessible. If a participant answers certain questions of the ELT correctly (see Appendix A4 for more information on the ELT), she passes Level 1 (*i.e.*, receives a bronze badge) without having to take METs 1, 2 and 3 and LET 1.

After submitting a test (ELT, MET or LET), investors receive a quick feedback (*e.g.*, "Correct!") for each question along with a detailed explanation of the correct answer which is

marked in green (see figure above). Participants can always go back to their test results. For the METs (and LETs) which investors can take as often as they want (until they pass the respective test), investors can access all previous test results.

The tests comprise different question types: multiple choice questions with one or more answers, drag and drop questions as well as open numerical questions, where investors must enter the correct answer. Selected question pools that test for investors' understanding of key concepts are included in various tests, the ELT, MET and/or LET. To be able to measure investors' learning progress, *i.e.*, the effect of the financial education program, the question pools used for the ELT (*i.e.*, questions 3 to 11 of the ELT) are also included in the respective LETs. In total, the program comprises 154 questions that are grouped into 58 question pools.[120]

At the end of each module, investors can test their newly acquired knowledge in a MET. Irrespective of whether the provided answers are correct or not, investors are able to take the respective LET only after having (worked through all three modules and having) answered all questions included in the three METs of each level. If investors do not finish a test, they can resume it where they stopped if they have saved their previous answers individually.

For each MET, the (order of the) questions are (is) randomized. Already selected questions do not re-enter the draw unless all questions of a question pool have already been selected. In that case, all questions re-enter the question pool, *i.e.*, are again considered in the randomization process. Depending on the respective module and the randomization, METs comprise two to six questions.

To pass a LET and (thus) obtain a badge, investors must answer at least 50 percent of the test questions correctly. For each LET, the question order is fixed. The LETs include, among others, the same question pools as the ELT and therefore allow us to measure investors' learning

[120] Some question pools contain only one question (*e.g.*, for eight ELT questions that are fixed and thus not randomly drawn).

progress, *i.e.*, the effect of the financial education program on their understanding of the measured concepts. For the first (second) [third] LET that investors pass they receive a bronze (silver) [gold] badge that is displayed to other investors (*e.g.*, when they comment in the Forum, if they invest in firm). LET 1 (2) [3] comprises 9 (8) [10] questions with the question order being fixed.

A4 Entry-Level-Test (ELT) Design

To measure investors' level of financial literacy before participating in the financial education program, invited investors are required to participate in an Entry-Level-Test (ELT) that also includes questions on investors' self-assessed financial literacy, their level of financial education, their numerical abilities as well as on their risk aversion and their time value of money. The question order of the ELT is fixed (see below). While questions 1 to 5 as well as questions 12 to 14 are the same for all participants, questions 6 to 11 are randomly selected out of a given question pool.

Investors can save each question individually, enabling them to resume the test where they stopped it in case that they do not finish it right away.

ELT: Measured Concepts

1. Self-assessed financial literacy
2. Self-assessed level of economic education

<u>(Basic) Financial literacy</u>

3. Interest
4. Inflation
5. Diversification

<u>Advanced financial literacy</u>

6. Equity vs. debt *(question randomly selected)*
7. Risk and return *(question randomly selected)*

<u>(Start-up related) Investment skills</u>

8. Evaluating the business model and market *(question randomly selected)*
9. Valuing firms *(question randomly selected)*
10. Valuing start-ups *(question randomly selected)*
11. Investment decision *(question randomly selected)*

12. Numeracy
13. Risk aversion
14. Time preferences

Notes: This figure displays the various concepts measured in the ELT.

A5 ELT Questions

[in German / *in English*; correct answer(s) is (are) underscored]

1. **Self-assessed Financial Literacy** (*e.g.*, van Rooij *et al.* 2011)

   Wie würden Sie Ihr Finanzwissen bzw. Ihre Finanzkenntnisse auf einer Skala von 1 („keine Kenntnisse“) bis 7 („umfassende Kenntnisse“) beurteilen? [Multiple choice: (i) scale from 1 meaning “Keine Kenntnisse” to 7 meaning “Umfassende Kenntnisse” or (ii) Keine Angabe]

   How would you assess your understanding of finance on a 7-point scale (1 means very low and 7 means very high)? [Multiple choice: (i) scale from 1 meaning “very low” to 7 meaning “very high” or (ii) No answer]

2. **Economic education** (*e.g.*, van Rooij *et al.* 2011)

   Wie intensiv haben Sie sich im Rahmen Ihrer Ausbildung mit betriebswirtschaftlichen oder volkswirtschaftlichen Themen auseinandergesetzt? [Multiple choice: (i) scale from 1 meaning “Gar nicht” to 7 meaning “Sehr intensiv” or (ii) Keine Angabe]

   How much of your education was devoted to topics in business or economics on a 7-point scale (1 means very low and 7 means very high)? [Multiple choice: (i) scale from 1 meaning “not at all” to 7 meaning “very intensive” or (ii) No answer]

3. **Interest** (*e.g.*, Lusardi and Mitchell 2011)

   Angenommen, Sie haben 100 Euro Guthaben auf Ihrem Sparkonto. Dieses Guthaben wird mit 2 Prozent pro Jahr verzinst und Sie lassen es 5 Jahre auf diesem Konto. Was meinen Sie: Wie viel Guthaben weist Ihr Sparkonto nach 5 Jahren auf? [Multiple Choice: (i) <u>Mehr als 102 Euro</u>; (ii) Genau 102 Euro; (iii) Weniger als 102 Euro; (iv) Keine Angabe]

Suppose you have 100 Euro in a savings account and the interest rate is 2 percent per year. After 5 years, how much do you think you would have in the account if you left the money to grow? [Multiple Choice: (i) More than 102 Euro; (ii) Exactly 102 Euro; (iii) Less than 102 Euro; (iv) No answer]

4. **Inflation** (*e.g.*, Lusardi and Mitchell 2011)

Angenommen, Ihr Sparkonto wird mit einem Zinssatz von 1 Prozent pro Jahr verzinst und die Inflationsrate beträgt 2 Prozent pro Jahr. Wie viel werden Sie sich in einem Jahr mit Ihrem Sparkontoguthaben leisten können? [Multiple Choice: (i) Mehr als heute; (ii) Genauso viel wie heute; (iii) Weniger als heute; (iv) Keine Angabe]

Imagine that the interest rate on your savings account is 1 percent per year and inflation is 2 percent per year. After one year, how much will you be able to buy with the money on your savings account? [Multiple Choice: (i) More than today; (ii) As much as today; (iii) Less than today; (iv) No answer]

5. **Diversification** (*e.g.*, Lusardi and Mitchell 2011)

Ist die folgende Aussage richtig oder falsch: "Die Anlage in Aktien eines einzelnen Unternehmens ist für gewöhnlich weniger riskant als die Beteiligung an einem Aktienfonds." [Multiple Choice: (i) Richtig; (ii) Falsch; (iii) Keine Angabe]

Is the following statement true or false: "Buying stocks of a single company usually provides a safer return than a stock mutual fund." [Multiple Choice: (i) True; (ii) False; (iii) No answer]

6. **Equity vs. debt** (*self-developed; question is randomly selected out of a pool of questions that might differ in the wording and or question type, but test for the same concept)*

Ordnern Sie in der Tabelle Eigenkapital (EK) und Fremdkapital (FK) die Charakteristika zu, die sie typischerweise aufweisen.

[Multiple-Choice Tabelle, in welcher [x] die richtigen Antworten anzeigt]

Merkmale	**Eigenkapital**	**Fremdkapital**
Mitbestimmungsrechte	X	
Zinsanspruch		X
Gewinnbeteiligung	X	
Vorrang im Insolvenzfall		X
Feste Laufzeit		X

Please match equity and debt with the characteristics that typically apply to them in the table.

[Multiple choice table with [x] indicating the correct answers.]

Characteristics	***Equity***	***Debt***
Voting rights	*X*	
Interest claims		*X*
Profitsharing	*X*	
Priority in case of insolvency		*X*
Fixed maturity		*X*

7. **Risk and return** (*self-developed; question is randomly selected out of a pool of questions that might differ in the wording and or question type, but test for the same concept)*

   Je niedriger das Risiko einer Anlage desto höher in der Regel deren Rendite. [Multiple Choice Wahr; Falsch; Keine Angabe]

   The lower the risk of an investment the higher its return. [True; False; No answer]

8. **Evaluating the business model and market** (*self-developed; question is randomly selected out of a pool of questions that might differ in the wording and or question type, but test for the same concept)*

Reicht die aktuelle Nachfrage nach seinem Produkt bereits aus, um dieses zu einem kostendeckenden Preis anzubieten, ist davon auszugehen, dass ein Start-up auch langfristig profitabel sein wird. [Wahr; Falsch; Keine Angabe]

It can be assumed that a start-up will be profitable in the long run if the current demand for its product is sufficient to market it for a cost-covering price. [True; False; No answer]

9. **Valuing firms** (*self-developed; question is randomly selected out of a pool of questions that might differ in the wording and or question type, but test for the same concept)*

   Im Rahmen einer Unternehmensbewertung ist es in der Regel sinnvoll auch subjektive Faktoren zu berücksichtigen. [Wahr; Falsch; Keine Angabe]

   When valuing a firm, it is generally useful to also consider subjective factors. [True; False; No answer]

10. **Valuing start-ups** (*self-developed; question is randomly selected out of a pool of questions that might differ in the wording and or question type, but test for the same concept)*

    Das Discounted Cash Flow-Verfahren kann im Regelfall problemlos auf junge Unternehmen angewendet werden. [Wahr; Falsch; Keine Angabe]

    Usually, the discounted cash flow method can easily be applied to young businesses. [True; False; No answer]

11. **Investment decision** (*self-developed; question is randomly selected out of a pool of questions that might differ in the wording and or question type, but test for the same concept)*

    Bei der Beurteilung des Erfolgspotentials eines Start-up-Investments sollten primär quantitative Faktoren (d.h. Jahresabschlussinformationen und Finanzprognosen) herangezogen werden. [Wahr; Falsch; Keine Angabe]

When evaluating the success potential of a start-up investment, the primary focus should be put on quantitative factors (i.e. balance sheet information and financial forecasts). [True; False; No answer]

12. Numeracy / quantitative reasoning (*e.g.*, Frederick 2005, Krische *et al.* 2014, Fernandes *et al.* 2014)

Stellen Sie sich vor, Sie gründen ein Start-up in einer alten Fabrikhalle. Gehen Sie davon aus, dass sich die Anzahl der Mitarbeiter bzw. Schreibtische jede Woche verdoppelt. Wenn es genau 24 Wochen dauert bis die Halle bis auf den letzten Quadratmeter mit Schreibtischen gefüllt ist und somit keinen Platz für neue Mitarbeiter bietet, wieviel Wochen dauert es dann, bis die Hälfte der Fabrikhalle mit Schreibtischen vollgestellt ist? [Multiple Choice: (i) 5 Wochen, (ii) 2 Wochen, (iii) 12 Wochen, (iv) 22 Wochen, (v) 18 Wochen, (vi) 14 Wochen, (vii) 23 Wochen, (viii) Keine Angabe]

You start a company in an old factory building. Assume that the number of employees and desks doubles every week. If it takes 24 weeks for the factory building to be occupied by desks and thus not offering any room for new employees, how long would it take for until half of the floor of the factory building is covered with desks? [Multiple Choice: (i) 5 weeks, (ii) 2 weeks, (iii) 12 weeks, (iv) 22 weeks, (v) 18 weeks, (vi) 14 weeks, (vii) 23 weeks, (viii) No answer]

13. Risk aversion (*e.g.*, Wölbert and Riedl 2013; Falk *et al.* 2016)

Stellen Sie sich vor, Sie haben die Möglichkeit an einer Lotterie teilzunehmen, bei der ein Münzwurf darüber entscheidet, wieviel Geld Sie gewinnen: Bei Kopf erhalten Sie 100 Euro, während Sie bei Zahl leer ausgehen. Welchen Betrag wären Sie maximal bereit für die Teilnahme an der Lotterie zu bezahlen? [(i) [entry box]; with „Euro" written next to it, *i.e.*, [entry box] „Euro", (ii) Keine Angabe]

Imagine you have the choice to participate in a lottery in which a coin toss decides how much money you win: if it is heads, you get 100 Euro, if it is tails you get nothing. How much would you be willing to pay for participating in the lottery? [(i) [entry box]; with "Euro" written next to it, i.e., [entry box] "Euro", (ii) No answer]

14. Time preferences (*e.g.*, Wölbert and Riedl 2013; Falk *et al.* 2016)

Nehmen Sie an, Sie haben die Möglichkeit 100 Euro für einen Zeitraum von drei Jahren fest und sicher anzulegen. Sie müssen sich somit entscheiden, ob Sie die 100 Euro lieber heute zur Verfügung haben oder das Geld jemand anderem überlassen möchten, um es nach drei Jahren (samt Zinsen) zurück zu erhalten. Wie hoch müsste der Rückzahlungsbetrag nach drei Jahren mindestens ausfallen, damit Sie es vorziehen würden das Geld fest anzulegen? [(i) [entry box]; with „Euro" written next to it, *i.e.*, [entry box] „Euro", (ii) Keine Angabe]

Assume that you have the opportunity to invest 100 Euro over a period of three years for a fixed and safe return. You must decide whether you would rather have 100 Euro at your disposal now or invest it to get it back after three years (including the accumulated interest). How high would the payback amount need to be for you to prefer investing the money? [(i) [entry box]; with "Euro" written next to it, i.e., [entry box] "Euro", (ii) No answer]

A6 (News)Letter with invitation to BETA-Test

On July 1, 2017, an invitation (see below for the original version) was sent per email to all 11,575 randomly selected investors. In addition, 889 members of the so-called "Business Club" on *Companisto* (*i.e.*, the most active investors) received this invitation letter per mail.

Original (news)letter:

COMPANISTO

Lieber Companist,

als Companist müssen Sie kein Wirtschaftsexperte sein, um eine Investmententscheidung zu treffen. Dennoch sollten Sie über das nötige Werkzeug verfügen, um die Chancen und Risiken von Startup-Investments kompetent beurteilen zu können.

Um Sie hierbei gezielt zu unterstützen, haben wir in Zusammenarbeit mit Professor Joachim Gassen und Nader Hemaidan von der Wirtschaftswissenschaftlichen Fakultät der Humboldt-Universität zu Berlin (HU Berlin) ein maßgeschneidertes Investoren-Trainingsprogramm entwickelt, das **Investor Education Tool**.

Sie wurden zufällig ausgewählt, das **neue Tool exklusiv vor Veröffentlichung online zu testen.** Der Test startet am 3. Juli ab 10:00 Uhr.

Über das Investor Training Tool

Das Tool ist in drei Level mit jeweils drei Modulen eingeteilt, die neben Investitionsgrundlagen die wesentlichen Methoden zur Analyse und Bewertung der Chancen und Risiken von Startups beinhalten.

Jedes Modul ist in sich abgeschlossen und beinhaltet interaktive Elemente und Kontrollfragen, damit Sie Ihren Trainingsfortschritt überprüfen können. Mittels eines kurzen „Fitnesstests" zu Beginn des Tools ermöglichen wir Ihnen einen optimalen Einstieg in unser Trainingstool und können gemeinsam mit der HU Berlin den Erfolg des Tools evaluieren.

Am BETA-Test des HU Investor Education Tool teilnehmen

Als Dankeschön ...

... verlosen wir unter allen Teilnehmern des BETA-Tests drei Weber-Grills: den Performance Deluxe Gourmet GBS®, den Original Kettle Premium™ Kugelgrill und einen Bar-B-Kettle® Kugelgrill. Für die Teilnahme am Gewinnspiel reicht die Angabe der E-Mail-Adresse am Ende des Tests.

Für Fragen zum BETA-Test können Sie sich gerne an Andreas Riedel (Investor Relations) wenden: (...).

Wir danken Ihnen für die Unterstützung!

Tamo Zwinge und David Rhotert

English translation:

Dear Companist,

As a member of Companisto, you don't need to be an expert in economics in order to make an investment decision. However, you should have the necessary know-how to competently assess the opportunities and risks associated with a startup-investment.

In order to support you in doing so, we created a custom-made investor training in collaboration with professor Joachim Gassen and Nader Hemaidan of Humboldt-Universität zu Berlin (HU Berlin): the **Investor Education Tool**.

You have been randomly selected to **exclusively test this new tool online prior to its release**. The test starts on July 3rd from 10am onwards.

About the Investor Training Tool

The tool is divided in three levels consisting of three modules. Topics covered are, besides basics of investing, essential methods to analyze and evaluate opportunities and risks of startups.

Each module is self-contained and features interactive elements and check-up questions enabling you to track the progress of your training. Upon first usage of the tool, you take a quick "Fitness-test" which helps to get you started ideally and also allows us to evaluate the success of the tool together with HU Berlin.

Participate in BETA-Test now

To thank you …

… all participants of the BETA-Test will be entered into a prize draw for three Weber-Grills: one Performance Deluxe Gourmet GBS®, one Original Kettle Premium™ Charcoal Grill and a Bar-B-Kettle® Charcoal Grill. To participate in the prize draw, just leave your email address at the end of the test.

If you have any questions regarding the BETA-Test don't hesitate to contact Andreas Riedel (Investor Relations): (…).

Thank you for your support!

A7 Program Evaluation Survey

Program Evaluation Survey: Newsletter

On August 21, 2017, a newsletter (see below for the original version) in which *Companisto* thanked investors for participating in the BETA-Test and asked them to evaluate the online financial education program was sent per email to all investors that participated in the BETA-Test.

Original newsletter:

COMPANISTO

Lieber Companist,

wie bereits angekündigt wurde der BETA-Test für das **Investoren Training Tool** am 20. August beendet.

Wir möchten uns herzlich für Ihre Teilnahme bedanken. Auf Basis Ihres Feedbacks werden wir das Tool überarbeiten und anschließend für alle Companisten verfügbar machen.

Sollten Sie sich im Rahmen der Schulung bereits ein Badge erarbeitet haben, erhalten Sie dieses natürlich, sobald das finale Tool online geht.

Zum erfolgreichen Abschluss des BETA-Tests würde es uns sehr freuen, wenn Sie die Schulungsinhalte **kurz bewerten** könnten. Bewerten Sie diese bitte losgelöst von etwaigen (technischen) Bugs und davon, ob Sie den Test komplett absolviert oder ihn unterbrochen haben.

Zur Bewertung des Training Tool BETA-Tests

Die Gewinner ...

... unserer Verlosung werden demnächst ermittelt und direkt über ihren Gewinn informiert. Wir wünschen Ihnen viel Glück bei der Ziehung.

Für weitere Fragen zum Abschluss des BETA-Tests und dem weiteren Vorgehen können Sie sich gerne an Andreas Riedel (Investor Relations) wenden: (…).

Mit besten Grüßen

Tamo Zwinge und David Rhotert

English translation:

Dear Companist,

As previously announced, the BETA-Test of the **Investor Training Tool** has been ended on August 20.

We would like to thank you for your participation. Based on your feedback, we will update the tool and then make it available to all Companists.

If you have already obtained a badge during the training you will keep it when the final tool goes live.

To successfully finalize the BETA-Test, you can help us by **briefly evaluating** the content of the training. Please make your evaluation independent of possible (technical) bugs and regardless whether you completed the test.

To the evaluation of the Training Tool BETA-Test

The winners ...

... of our prize draw will be identified soon and contacted directly. Good luck!

If you have any questions regarding the BETA-Test or the next steps please contact Andreas Riedel (Investor Relations): (…).

Kind Regards,

(…)

Program Evaluation Survey: Questions

Participants that accessed the link to the feedback page were asked to answer several self-generated questions (see below), abstracting from any (technical) bugs [original / *English*].

1. Ich habe mich intensiv mit den Schulungsinhalten auseinandergesetzt: [Skala: 1: Stimme voll zu ... 7: Stimme überhaupt nicht zu, 8: Keine Antwort]

   I have intensively dealt with the content of the training: [Scale: 1: Fully agree ... 7: Do not agree at all, 8: No answer]

2. Der Schwierigkeitsgrad der Schulung ist... [Skala 1: 1: ...viel zu niedrig, 2: ... zu niedrig, 3: ... etwas niedrig, 4: ... genau richtig, 5: ... etwas hoch, 6: ... zu hoch, 7: ... viel zu hoch, 8: Keine Antwort]

   The difficulty of the training is... [Scale: 1: ...far too low, 2: ... too low, 3: ... quite low, 4: ... just right, 5: ... quite high, 6: ... too high, 7: ... far too high, 8: No answer]

3. Ich habe durch die Schulung etwas gelernt: [Skala: 1: Stimme voll zu ... 7: Stimme überhaupt nicht zu, 8: Keine Antwort]

   I learned a lot from the training: [Scale: 1: Fully Agree ... 7: Do not agree at all, 8: No answer]

4. Durch die Schulung fühle ich mich besser in der Lage, eine Investitionsentscheidung zu treffen: [Skala: 1: Stimme voll zu ... 7: Stimme überhaupt nicht zu, 8: Keine Antwort]

   Having participated in the training, I feel more confident to make an investment decision: [Scale: 1: Fully Agree ... 7: Do not agree at all, 8: No answer]

5. Unerfahrenen Companisten würde ich zur Teilnahme an der Schulung raten: [Skala: 1: Stimme voll zu ... 7: Stimme überhaupt nicht zu, 8: Keine Antwort]

I would encourage less experienced investors on Companisto to participate in the training: [Scale: 1: Fully Agree ... 7: Do not agree at all, 8: No answer]

6. Sonstiges Feedback:

   Further feedback: [Empty text field]

A8 ELT Results

	Enrollment Sample	Participation Sample	van Rooij *et al.* (2011)	Bucher-Koennen and Lusardi (2011)
Data *(N, year of survey, country)*	*N = 462*	*N = 234*	*N = 1,508* *(2005 and 2006, Netherlands)*	*N = 1,059* *(2009, Germany)*
Self-assessed Skills *[(Standardized) scale from (0) 1 to (1) 7]*				
Financial Literacy	57%	58%	31.1%[1]	
Financial Education	54%	52%		
Financial Literacy				
Correct on Interest	99%	98%	90.8%	82.4%
Correct on Inflation	99%	99%	82.6%	78.4%
Correct on Diversification	97%	97%	60.8%	61.8%
Advanced Financial Literacy				
Correct on Asset Class Attributes	72%	73%		
Correct on Risk and Return	93%	94%		
Investment Skills				
Correct on Business Model Evaluation	50%	54%		
Correct on Valuation	38%	38%		
Correct on Start-up Valuation	49%	56%		
Correct on Investment Decision	64%	66%		
Numeracy	62%	68%		

Notes: This table shows the average ELT results by test question for both the entry and the participation sample. In addition, for the questions underlying the financial literacy score (*fin literacy*) the results of two related studies are provided. Please note that the results for ELT questions 13 ("Time Preferences") and 14 ("Risk Aversion") are not yet included in this preliminary version of the paper. See Appendix A5 for the exact wording of the ELT questions. [1] Self-computed based on provided data.

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FIGURE 1

Start-ups' Information Environment on Companisto

Notes: This figure displays the landing page of an issuance on *Companisto*. In this so-called "Summary"-section, which includes a pitch video, investors are provided with general information on the business. In the other information sections, investors are provided with information on investments by other investors ("Companists"), their expected return on investment ("Return Calculator"), regular information updates ("Updates"), a forum ("Discussion"), projected financial information ("Financial Data") and the profiles and social media links of the members of the start-ups' managing team ("Team").

FIGURE 2

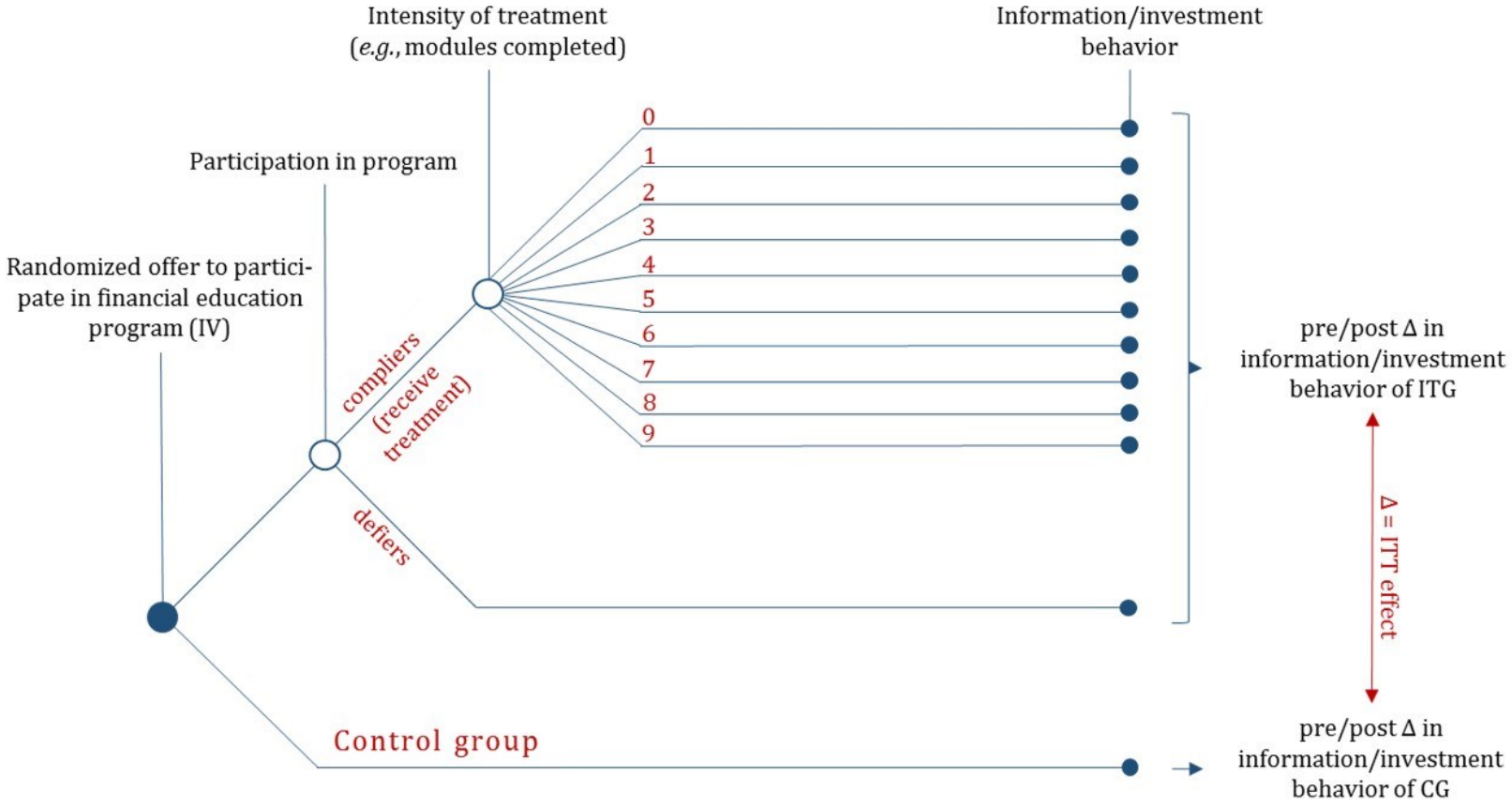
Investor Education Program: Concept

Entry-Level-Test (ELT)
‘How, in What and Where to invest?’ **Module-End-Test (MET) 1**
‘Return-risk-profile’ **MET 2**
‘Management of investment opportunities and -risks’ **MET 3**
Level-End-Test (LET) 1
‘Opportunities and risks of start-up-investments’ **MET 4**
‘Evaluation of opportunities and risks on *Companisto*’ **MET 5**
‘Analysis of business model and market’ **MET 6**
LET 2
‘Fundamentals of corporate valuation’ **MET 7**
‘Valuing Start-ups‘ **MET 8**
‘Investment decision‘ **MET 9**
LET 3

Notes: This figure displays the general concept of the investor education program. ELT (MET) [LET] is the abbreviation for Entry-Level-Test (Module-End-Test) [Level-End-Test].

FIGURE 3

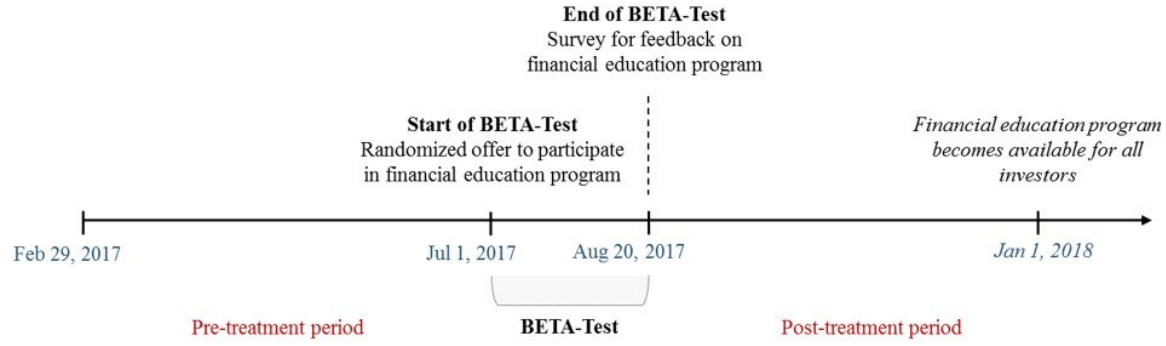
Identification Strategy



Notes: This figure depicts the empirical strategy used to measure the intention-to-treat (ITT) effect, *i.e.*, the effect of the randomized invitation to participate in the financial education program, on participants' information and investment behavior. The ITT is measured through a difference-in-differences approach. Specifically, the ITT results from the difference between the intention to treat group (ITG) and control group (CG) in the change of investors' information and investment behavior from the pre- to the post period.

FIGURE 4

Time Structure of Experiment



Notes: This figure displays the time structure of the experiment.

TABLE 1

Sample Selection and Composition

Panel A: Sample selection process

	Investors
User data from *Companisto*	69,955
less investors that do not (want to) receive a newsletter	*-3,305*
less investors that do not (want to) receive a letter	*-166*
less investors with no investments on *Companisto*	*-50,014*
less investors that are not registered as 'retail' investors	*-367*
less investors from a country other than Austria, Germany or Switzerland	*-662*
less investors with missing information (*i.e.*, date of birth)	*-8*
Sample used for randomization	**15,433**
Business Club (BC) members	*1,174*
Other investors	*14,259*
Treatment Group (i.e., 'Beta-Testers')	*11,575 (75%)*
Control Group	*3,858 (25%)*

Panel B: Randomization result

Group	Obs.	*age*	*gender (male = 1)*	*nr_startups*	*active*	*bc*	Austrian	German	Swiss
Treatment	11,575	38.69	82.89%	3.25	33.09%	7.61%	5.81%	90.62%	3.58%
Control	3,858	38.53	83.02%	3.24	33.75%	7.59%	5.83%	90.62%	3.55%
Total	**15,433**	**38.65**	**82.92%**	**3.25**	**33.25%**	**7.61%**	**5.81%**	**90.62%**	**3.57%**

Notes: This table shows the (steps taken to select the) sample used for the empirical analyses in this study. Specifically, in Panel A (B) the sample selection process (randomization result) is presented. See Appendix A1 for variable definitions.

TABLE 2

Summary Statistics and Correlations – Treatment Sample (N=11,575)

Panel A: Summary Statistics

Variable	Mean	SD	Min	P25	P50	P75	Max
enrolled	0.040	0.196	0.000	0.000	0.000	0.000	1.000
participated	0.020	0.141	0.000	0.000	0.000	0.000	1.000
age	38.69	11.58	18.32	29.90	36.20	46.36	96.45
gender	0.829	0.377	0.000	1.000	1.000	1.000	1.000
nr_startups	3.250	5.482	1.000	1.000	1.000	3.000	82.000
lnr_startups	0.656	0.865	0.000	0.000	0.000	1.099	4.407
total_amount	2,074	8,581	4.000	100.0	350.0	1,373	500,000
ltotal_amount	5.824	1.998	1.386	4.605	5.858	7.224	13.122
active	0.331	0.471	0.000	0.000	0.000	1.000	1.000
bc	0.076	0.265	0.000	0.000	0.000	0.000	1.000
t*ook_survey*	0.423	0.494	0.000	0.000	0.000	1.000	1.000
inexperienced	0.027	0.161	0.000	0.000	0.000	0.000	1.000

Panel B: Correlations

N = 11,575	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
A *enrolled*		**0.70**	-0.01	**0.06**	**0.16**	**0.18**	**0.09**	**0.14**	**0.21**	**0.19**	**0.18**	**0.10**
B *participated*	**0.70**		0.00	**0.04**	**0.12**	**0.14**	**0.09**	**0.12**	**0.16**	**0.16**	**0.13**	**0.08**
C *age*	-0.01	0.00		**-0.08**	0.00	-0.01	**0.13**	**0.28**	**-0.03**	**0.15**	**-0.05**	**-0.02**
D *gender*	**0.06**	**0.04**	**-0.08**		**0.11**	**0.17**	**0.06**	**0.15**	**0.13**	**0.07**	**0.14**	**0.04**
E *nr_startups*	**0.16**	**0.13**	-0.01	**0.18**		**0.81**	**0.18**	**0.34**	**0.32**	**0.22**	**0.28**	**0.06**
F *lnr_startups*	**0.16**	**0.13**	-0.01	**0.18**	**1.00**		**0.20**	**0.46**	**0.42**	**0.29**	**0.37**	**0.12**
G *total_amount*	**0.14**	**0.11**	**0.29**	**0.15**	**0.46**	**0.46**		**0.41**	**0.11**	**0.34**	**0.09**	**0.02**
H *ltotal_amount*	**0.14**	**0.11**	**0.29**	**0.15**	**0.46**	**0.46**	**1.00**		**0.30**	**0.47**	**0.28**	**0.09**
I *active*	**0.21**	**0.16**	**-0.03**	**0.13**	**0.41**	**0.41**	**0.31**	**0.31**		**0.28**	**0.82**	**0.17**
J *bc*	**0.19**	**0.16**	**0.14**	**0.07**	**0.27**	**0.27**	**0.44**	**0.44**	**0.28**		**0.26**	**0.10**
K t*ook_survey*	**0.18**	**0.13**	**-0.06**	**0.14**	**0.36**	**0.36**	**0.29**	**0.29**	**0.82**	**0.26**		**0.19**
L *inexperienced*	**0.10**	**0.08**	**-0.02**	**0.04**	**0.12**	**0.12**	**0.10**	**0.10**	**0.17**	**0.10**	**0.19**	

Notes: This table presents the descriptive statistics for the investor and participation attributes for the treatment sample. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, Pearson's correlation coefficients are shown in the upper triangle while Spearman's rank correlations appear below the diagonal. Statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. See Appendix A1 for the variable definitions.

TABLE 3

Summary Statistics and Correlations – Enrollment Sample (N=436)

Panel A: Summary Statistics

Variable	Mean	SD	Min	P25	P50	P75	Max
participated	0.506	0.500	0.000	0.000	1.000	1.000	1.000
age	38.18	12.10	18.58	28.95	35.35	46.40	78.10
gender	0.933	0.250	0.000	1.000	1.000	1.000	1.000
nr_startups	7.552	10.430	1.000	2.000	4.000	9.000	78.000
lnr_startups	1.423	1.066	0.000	0.693	1.386	2.197	4.357
total_amount	5,692	12,907	4.000	400.0	1,503	6,423	177,500
ltotal_amount	7.196	1.980	1.386	5.991	7.315	8.767	12.087
active	0.814	0.390	0.000	1.000	1.000	1.000	1.000
bc	0.327	0.470	0.000	0.000	0.000	1.000	1.000
fin_lit_self_assessed	0.573	0.222	0.000	0.500	0.667	0.667	1.000
fin_ed_self_assessed	0.537	0.315	0.000	0.333	0.500	0.833	1.000
fin_literacy	2.950	0.227	1.000	3.000	3.000	3.000	3.000
adv_fin_literacy	1.654	0.387	0.000	1.500	1.750	2.000	2.000
inv_skills	2.017	1.050	0.000	1.000	2.000	3.000	4.000
numeracy	0.623	0.485	0.000	0.000	1.000	1.000	1.000

TABLE 3 *(continued)*

Summary Statistics and Correlations – Enrollment Sample

Panel B: Correlations

N = 462	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
A *participated*		0.03	-0.02	0.03	**0.09**	**0.12**	**0.13**	**0.10**	**0.12**	0.04	-0.05	-0.03	0.02	**0.12**	**0.12**
B *age*	0.04		**-0.13**	-0.01	-0.06	**0.15**	**0.23**	-0.05	**0.23**	0.05	0.00	0.04	0.03	**-0.09**	0.05
C *gender*	-0.02	**-0.12**		**0.11**	**0.15**	0.08	**0.13**	**0.09**	**0.09**	**0.20**	**0.16**	0.06	**0.13**	**0.08**	**0.10**
D *nr_startups*	**0.10**	-0.04	**0.15**		**0.81**	**0.24**	**0.34**	**0.23**	**0.15**	**0.17**	0.03	0.07	0.03	-0.06	0.06
E *lnr_startups*	**0.10**	-0.04	**0.15**	**1.00**		**0.32**	**0.54**	**0.37**	**0.33**	**0.20**	0.04	0.05	0.04	-0.05	**0.08**
F *total_amount*	**0.13**	**0.27**	**0.13**	**0.55**	**0.55**		**0.57**	**0.15**	**0.49**	0.07	-0.03	0.04	0.06	-0.05	**0.12**
G *ltotal_amount*	**0.13**	**0.27**	**0.13**	**0.55**	**0.55**	**1.00**		**0.28**	**0.71**	**0.17**	0.02	**0.12**	**0.11**	-0.03	**0.12**
H *active*	**0.10**	-0.05	**0.09**	**0.38**	**0.38**	**0.29**	**0.29**		**0.27**	**0.12**	0.04	-0.01	-0.02	0.03	0.06
I *bc*	**0.12**	**0.25**	**0.09**	**0.36**	**0.36**	**0.78**	**0.78**	**0.27**		**0.15**	0.00	0.03	**0.08**	-0.01	**0.19**
J *fin_lit_self_assessed*	0.04	**0.12**	**0.16**	**0.19**	**0.19**	**0.18**	**0.18**	**0.11**	**0.15**		**0.58**	**0.12**	**0.18**	**0.22**	**0.10**
K *fin_ed_self_assessed*	-0.05	0.02	**0.16**	0.05	0.05	0.02	0.02	0.05	0.00	**0.58**		0.07	**0.21**	**0.19**	0.02
L *fin_literacy*	-0.04	0.04	0.06	0.04	0.04	**0.08**	**0.08**	0.00	0.03	**0.12**	0.06		**0.08**	0.02	0.07
M *adv_fin_literacy*	0.05	0.05	**0.09**	0.02	0.02	**0.10**	**0.10**	-0.01	0.07	**0.24**	**0.26**	0.05		**0.11**	0.02
N *inv_skills*	**0.12**	**-0.08**	0.07	-0.04	-0.04	-0.03	-0.03	0.03	-0.01	**0.23**	**0.18**	0.02	**0.17**		0.06
O *numeracy*	**0.12**	0.06	**0.10**	**0.08**	**0.08**	**0.14**	**0.14**	0.06	**0.19**	**0.09**	0.03	0.06	0.02	0.04	

Notes: This table presents the descriptive statistics for the investor and participation attributes for the entry sample. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, Pearson's correlation coefficients are shown in the upper triangle while Spearman's rank correlations appear below the diagonal. Statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. See Appendix A1 for the variable definitions.

TABLE 4

Summary Statistics and Correlations – Participation Sample (N=234)

Panel A: Summary Statistics

Variable	Mean	SD	Min	P25	P50	P75	Max
persistence	2.863	1.206	1.099	1.609	2.996	4.290	4.727
performance	0.792	0.116	0.333	0.734	0.806	0.870	1.000
age	38.53	11.79	18.58	29.41	35.92	46.43	73.30
gender	0.927	0.260	0.000	1.000	1.000	1.000	1.000
nr_startups	7.850	10.067	1.000	2.000	4.000	9.000	78.000
lnr_startups	1.518	1.031	0.000	0.693	1.386	2.197	4.357
total_amount	7,196	16,436	4.000	520.0	2,300	7,340	177,500
ltotal_amount	7.451	1.966	1.386	6.253	7.740	8.901	12.087
active	0.850	0.357	0.000	1.000	1.000	1.000	1.000
bc	0.380	0.487	0.000	0.000	0.000	1.000	1.000
fin_lit_self_assessed	0.582	0.223	0.000	0.500	0.667	0.667	1.000
fin_ed_self_assessed	0.521	0.324	0.000	0.167	0.500	0.833	1.000
fin_literacy	2.944	0.230	2.000	3.000	3.000	3.000	3.000
adv_fin_literacy	1.661	0.406	0.000	1.425	1.750	2.000	2.000
inv_skills	2.137	1.039	0.000	1.000	2.000	3.000	4.000
numeracy	0.679	0.468	0.000	0.000	1.000	1.000	1.000

TABLE 4 *(continued)*

Summary Statistics and Correlations – Participation Sample

Panel B: Correlations

N = 234	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	O	P
A *persistence*		**0.16**	0.09	-0.03	0.05	0.08	0.03	0.10	-0.03	**0.19**	**0.14**	-0.04	0.03	**0.18**	0.03	0.03
B *performance*	0.09		0.00	0.03	-0.05	-0.05	-0.04	-0.04	-0.07	0.05	0.02	0.05	0.08	**0.17**	**0.13**	0.10
C *age*	0.10	-0.02		-0.06	-0.04	-0.07	**0.16**	**0.24**	-0.09	**0.25**	0.08	-0.02	0.08	-0.02	-0.11	0.09
D *gender*	-0.02	0.04	-0.06		**0.15**	**0.22**	0.10	**0.26**	**0.21**	**0.19**	**0.29**	**0.17**	0.08	**0.21**	**0.12**	0.05
E *nr_startups*	0.07	-0.07	-0.05	**0.23**		**0.82**	**0.25**	**0.37**	**0.21**	**0.18**	0.11	-0.03	0.07	0.06	-0.06	0.04
F *lnr_startups*	0.07	-0.07	-0.05	**0.23**	**1.00**		**0.31**	**0.55**	**0.33**	**0.37**	**0.15**	0.00	0.04	0.05	-0.09	0.03
G *total_amount*	**0.14**	-0.05	**0.27**	**0.24**	**0.55**	**0.55**		**0.57**	**0.13**	**0.46**	0.03	-0.06	0.05	0.06	**-0.11**	0.09
H *ltotal_amount*	**0.14**	-0.05	**0.27**	**0.24**	**0.55**	**0.55**	**1.00**		**0.24**	**0.73**	0.09	-0.02	0.07	0.10	**-0.14**	0.06
I *active*	-0.04	-0.10	**-0.12**	**0.21**	**0.33**	**0.33**	**0.23**	**0.23**		**0.23**	0.06	0.06	0.00	-0.04	0.07	-0.03
J *bc*	**0.18**	0.02	**0.25**	**0.19**	**0.39**	**0.39**	**0.81**	**0.81**	**0.23**		0.09	-0.07	0.00	**0.13**	-0.07	**0.16**
K *fin_lit_self_assessed*	**0.13**	0.03	**0.14**	**0.24**	**0.14**	**0.14**	0.10	0.10	0.06	0.08		**0.57**	0.08	**0.20**	**0.31**	0.09
L *fin_ed_self_assessed*	-0.04	0.07	0.00	**0.17**	0.00	0.00	-0.03	-0.03	0.06	-0.07	**0.59**		0.01	**0.28**	**0.20**	0.02
M *fin_literacy*	0.03	0.07	0.09	0.08	0.04	0.04	0.05	0.05	0.00	0.00	0.07	0.01		-0.02	-0.08	-0.01
N *adv_fin_literacy*	**0.20**	**0.19**	0.05	**0.14**	0.04	0.04	**0.11**	**0.11**	-0.03	0.09	**0.26**	**0.33**	-0.01		**0.17**	0.05
O *inv_skills*	0.03	0.10	-0.09	**0.11**	-0.09	-0.09	**-0.13**	**-0.13**	0.07	-0.08	**0.31**	**0.19**	-0.07	**0.22**		0.04
P *numeracy*	0.03	**0.13**	0.08	0.05	0.04	0.04	0.10	0.10	-0.03	**0.16**	0.09	0.03	-0.01	0.03	0.04	

Notes: This table presents the descriptive statistics for the investor and participation attributes for the participation sample. Specifically, summary statistics (Panel A) and correlations (Panel B) are presented. In Panel B, Pearson's correlation coefficients are shown in the upper triangle while Spearman's rank correlations appear below the diagonal. Statistical significance at the 0.1 level using two-tailed tests is indicated in bold type. See Appendix A1 for the variable definitions.

TABLE 5

Regression Results

	Dependent variable			
	Enrolled	***Participated***	***Persistence***	***Performance***
	logistic	*logistic*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)
age	-0.011**	0.003	0.004	0.0001
	(0.005)	(0.009)	(0.007)	(0.001)
gender	0.465**	-0.423	-0.586*	0.008
	(0.195)	(0.405)	(0.325)	(0.032)
lnr_startups	0.282***	0.054	0.074	0.001
	(0.057)	(0.115)	(0.095)	(0.009)
ltotal_amount	0.061	0.091	-0.053	-0.007
	(0.040)	(0.081)	(0.066)	(0.007)
active	1.371***	0.285	-0.110	-0.029
	(0.239)	(0.272)	(0.234)	(0.023)
bc	0.870***	0.121	0.513**	0.035
	(0.150)	(0.299)	(0.237)	(0.024)
took_survey	0.363			
	(0.261)			
inexperienced	0.625***			
	(0.175)			
fin_lit_self_assessed		0.545	1.265***	-0.043
		(0.562)	(0.455)	(0.045)
fin_ed_self_assessed		-0.682*	-0.630**	0.014
		(0.386)	(0.298)	(0.030)
fin_literacy		-0.366	0.162	0.053
		(0.432)	(0.335)	(0.033)
adv_fin_literacy		0.097	0.585***	0.039*
		(0.260)	(0.202)	(0.020)
inv_skills		0.251***	-0.027	0.016**
		(0.097)	(0.082)	(0.008)
Constant & Country FE	Yes	Yes	Yes	Yes
Obs.	11,575	462	234	234
McFadden Pseudo R^2	0.169	0.041		
Adjusted R^2			0.087	0.033

Notes: This table reports the results of multiple regression analyses that differ with regard to the dependent variable and (thus) the employed regression method. Column 1 (2) presents the results of a logistic regression with *enrolled* (*participated*) as dependent variable. Column 3 (4) presents the results of an OLS regression with *persistence* (*performance*) as dependent variable. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels (two-sided), respectively. See Appendix A1 for the variable definitions.